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Durability Demonstration of Systems for Control of Sulfuric Acid

Southwest Research Inst.
San Antonio, TX

Prepared for

Environmental Protection Agency
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16. ABSTRACT

The report describes development testing, optimization, and durability testing of emission control systems capable of meeting 1981 gaseous emission standards while maintaining low sulfate emissions. Four emission control systems were investigated: (1) oxidation catalyst with air modulation system, (2) high temperature exhaust system, (3) threeway catalyst with feedback carburetor, and (4) threeway plus oxidation with air modulation system and feedback fuel injection.

In Phase I of the project, the air modulation system and the threeway catalyst system were selected for optimization and durability testing. The usual gaseous emissions, plus nonmethane hydrocarbons, total cyanide and ammonia were measured on both systems. The oxidation system was operated on a test car for 24100 km and the threeway catalyst system for 32200 km, with emission tests every 8050 km. The durability distance accumulation was halted on both cars because emissions levels exceeded the 1981 standards.

In Phase II of the project, a threeway plus oxidation catalyst system was developed, optimized and tested for durability for 64,400 km. During the durability testing, emissions tests were performed every 8050 km.

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Durability Demonstration of Systems for Control of Sulfuric Acid

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Office of Air, Noise and Radiation
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Publication No. EPA-460/3-80-007

ABSTRACT

The work described in this report involved the development testing, optimization, and durability testing of emission control systems capable of meeting the 1981 gaseous emission standards while maintaining low sulfate emissions. Four emission control systems were investigated: (1) oxidation catalyst with air modulation system, (2) high temperature exhaust system, (3) threeway catalyst with feedback carburetor, and (4) three way plus oxidation catalyst with air modulation system and feedback fuel injection.

In Phase I of the project, the air modulation system and the threeway catalyst system were selected for optimization and durability testing. In addition to the usual gaseous emissions, nonmethane hydrocarbons, total cyanide and ammonia were measured on both systems. The oxidation system was operated on a test car for 24100 km (15,000 miles) and the threeway catalyst system for 32200 km (20,000 miles), with emission tests every 8050 km (5,000 miles). The durability distance accumulation was halted on both cars because gaseous emission levels exceeded the 1981 standards.

In Phase II of the project, a threeway plus oxidation catalyst system was developed, optimized and tested for durability for 64,400 km (40,000 miles). During the durability testing, emissions tests were performed every 8050 km (5000 miles).

FOREWORD

This project was conducted for the U.S. Environmental Protection Agency by the Department of Emissions Research for Southwest Research Institute. The project was begun in November 1976, and the laboratory work was completed in September 1979. The project was conducted under EPA contract No. 68-03-2481 and was identified within Southwest Research Institute as Project 11-4746.

During the course of the project, several of the personnel in the Emission Control Technology Division, Office of Mobile Source Pollution Control, Environmental Protection Agency, Ann Arbor, Michigan, served as EPA Project Officer. These persons were: Randall H. Field, John J. McFadden, Kenneth Partymiller, Andrew W. Kaupert and Robert I. Bruetsch. Karl J. Springer, Director, Department of Emissions Research at Southwest Research Institute, served as Project Manager. The project was under the supervision of Melvin N. Ingalls, Senior Research Engineer,as Project Leader. Although a number of Department of Emissions Research personnel were involved in the project, key personnel included C. E. Grinstead, senior technician and C. D. Suhler, lead technician, who were responsible for installation and maintenance of the mechanical systems; N. C. Reeh, senior technician, who fabricated much of the necessary systems hardware; and J. T. Jack, Jr., senior technician, and D. A. Travers, technician, who were responsible for the emissions testing.

Project Review meetings involving EPA and SwRI personnel, either at SwRI or the EPA facility in Ann Arbor, Michigan, were held on November 23, 1976, December 10, 1976, August 23, 1977 and June 7, 1978. In addition, frequent telephone conversations between the Project Leader at SwRI and the EPA Project Officer insured a proper understanding by both SwRI and EPA of the project aims, problems and accomplishments.

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SUMMARY

The objective of this project was to demonstrate the durability of two low sulfate emission control systems capable of meeting the 1981 gaseous emission standards. In numerical terms, the Project emission goals were as shown below.

Test Cycle	Emission Type	Goal
FTP	HC	0.25 g/km (0.41 g/mi.)
FTP	CO	2.11 g/km (3.4 g/mi.)
FTP	NO_x	0.62 g/km (1.0 g/mi.)
CFDS	$SO_4^=$	3.11 mg/km (5.0 mg/mi.)

Initially, the project emphasis was to be on the durability testing of developed advanced systems. However, most of the advanced systems existed only in concept or tailored to a single engine model only. Therefore, hardware development necessarily became a large part of the project.

Phase I

At the outset of the project it was decided that a threeway catalyst with feedback fuel control system would be one of the systems tested for durability. The other system would be either an oxidation catalyst with modulated air injection and EGR, or a high temperature exhaust system with standard air injected oxidation catalyst and EGR. Which of these two systems would be tested for durability would depend of the results of the evaluation testing.

The oxidation catalyst, modulated air injection system was evaluated on a 1976 Chevrolet Impala with a 5.7 litre (350 CID) engine. The high temperature exhaust system was evaluated on a 1975 Chevrolet Nova with a 5.7 litre (350 CID) engine. While neither system met the project goals during the evaluation, the modulated air injection was selected as having the best chance of meeting the goals with further optimizaiton.

The 1975 Chevrolet Nova was to be used as the durability test vehicle. Therefore, the air modulation system was installed on the Nova and a series of tests run, modifying the system as necessary during the testing to produce a system capable of meeting the project goals. The final emission control system consisted of the following elements and changes from stock condition:

- Two monolith oxidation catalysts, one in the exhaust pipe of each cylinder bank
- Modulated air injection to catalyst
- 2.56 rear axle ratio replacing standard 3.08 ratio rear axle
- Ignition timing advanced from 6° to 9° BTC
- Increased EGR
- Single plane aluminum intake manifold

The emission levels for the optimized system are listed below:

Test Cycle	Emission Type	Value
FTP	HC	0.18 g/km (0.29 g/mi.)
FTP	CO	1.03 g/km (1.65 g/mi.)
FTP	NO_x	0.48 g/km (0.77 g/mi.)
CFDS	$SO_4^=$	3.85 mg/km (6.19 mg/mi.)

A 1977 Plymouth Fury was used as the test car for the threeway catalyst system. A series of optimization tests were run during which system hardware and settings were changed to produce a system that would meet the project goals. The final emission control system consisted of the following elements:

- Two threeway catalysts with 5 to 1 Pt/Rd ratio. One catalyst on the exhaust of each cylinder bank.
- Experimental Holley feedback carburetor
- An SwRI built open loop fuel control circuit, independent of the fuel system main electronic control unit, for use during cold starts
- An EGR system
- Shortened cold start operation of the choke, inlet air heater and manifold heat
- Orifice spark advance control (OSAC) ststem

The emission levels for the optimization system are listed below:

Test Cycle	Emission Type	Value
FTP	HC	0.09 g/km (0.14 g/mi.)
FTP	CO	1.98 g/km (3.19 g/mi.)
FTP	NO_x	0.43 g/km (0.69 g/mi.)
CFDS	SO_4	0.57 mg/km (0.92 mg/mi.)

Following optimization, both systems were tested for durability using the Durability Driving Schedule. Emission tests were performed every 8050 km (5,000 miles). Durability testing was halted at 24100 km (15,000) on the 1975 Nova with the air modulation system and at 32200 km (20,000 miles) on the 1977 Fury because some of the gaseous emissions on both systems were above the 1981 standards.

Phase II

In a continuation of the effort to meet the project goals, an air injected oxidation catalyst was added to a stock Volvo threeway catalyst system on a 1978 California Volvo sedan with a four cylinder engine. Since threeway plus oxidation catalyst systems can produce large amounts of sulfates, an air modulation scheme was included as part of the air injection system. Considerable optimization testing was required before the system met the project goals. The final emission control system consisted of the following additions and changes to the stock California Volvo threeway catalyst system.

- Oxidation catalyst
- Modulated air injection system
- Open loop cold start fuel control circuit
- A/F ratio leaner than stock setting

The emission levels for the optimized system are listed below:

Test Cycle	Emission Type	Value
FTP	HC	0.14 g/km (0.23 g/mi.)
FTP	CO	1.31 g/km (2.10 g/mi.)
FTP	NO_x	0.13 g/km (0.23 g/mi.)
CFDS	$SO_4^=$	0.04 mg/km (0.06 mg/mi.)

Following optimization, the system was tested for durability for 64,400 km (40,000 miles) using the Durability Driving Schedule. Emission tests were performed every 8050 km (5,000 miles). At the end of the durability testing, the HC, NO_x and sulfate emissions were still within the project goals. The CO emissions were greater than the 1981 standards by approximately seven percent.

Emission tests with the car in stock condition at the end of the durability testing indicated that most of the emission increases were caused by deterioration of the air modulation system hardware. Therefore for a system such as tested in this project to pass an 80500 km (50,000 mile) certification test, requires only more durable air modulation hardware. Thus the project demonstrated that it is possible to meet the 1981 gaseous emission standards while maintaining low sulfate emissions.

I. INTRODUCTION

Sulfuric acid (sulfate) emissions from catalyst equipped cars have been extensively studied by EPA for the past several years.(1-5)* At present, it appears that automotive sulfate emissions standards are not necessary. However, with the expected extensive use of threeway plus oxidation catalyst emission control system in 1981, there is a possibility of greatly increased sulfate emissions due to the tendency of this system to produce larger amounts of sulfates than current control systems.(5-7) In addition, the 1977 Amendments to the Clean Air Act, as interpreted by EPA in OMSAPC Advisory Circular 76, places the burden on the manufacturers to establish that their emission control systems, or vehicle and engine design elements, do not cause an unreasonable risk to public health, welfare or safety.(6) The Advisory Circular specifically names sulfates as one of the unregulated emissions to be considered.

This study was undertaken to evaluate the low sulfate potential of several emission control systems proposed for meeting the 1981 gaseous emissions standards and to demonstrate the durability of two of these systems. It builds upon research in mobile source sulfate emissions conducted at Southwest Research Institute for EPA and others since 1975.(7-11)

Initially, the project emphasis was to be on the durability testing of developed advanced systems. However, most of the advanced systems existed only in concept or tailored to a single engine model. Therefore, hardware development necessarily became a large part of the project.

Objective

The objective of this project was to evaluate a variety of emission control systems which would produce low sulfate emissions and meet the 1981 gaseous emission standards of 0.26 g/km (0.41 g/mile) HC, 2.11 g/km (3.4 g/mile) CO, and 0.62 g/km (1.0 g/mile) NO_x after 80500 km (50,000 miles). Low sulfate emissions were defined to be below 3.1 mg/km (5 mg/mile). Following the evaluation, two of the most promising systems were to be optimized and tested for durability.

Approach

To meet the objectives of the project, three emission control systems were chosen from the approximately six systems proposed. These three systems were fabricated and installed on test vehicles or, in one case, obtained already installed from the car manufacturer. Chassis dynamometer tests over the light-duty Federal Test Procedure (FTP) and the Congested Freeway Driving Schedule

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*Superscript numbers in parentheses refer to references at the end of this report.

(CFDS) were performed to evaluate the ability of the system to produce low sulfate emissions, while meeting the 1981 gaseous emission standards. The two most promising systems, the modulated air injection system and the three-way catalyst system, were optimized and durability tested for approximately 32,000 km (20,000 miles). Durability distance accumulation was halted on both cars because some FTP gaseous emissions rates were above the 1981 limits.

In Phase II of the project, a threeway plus oxidation catalyst system with modulated air injection was chosen for use in a continued effort to meet the project emission objectives. This system was used on a five passenger Volvo sedan with a four-cylinder, fuel injected engine. The air modulation system was optimized and the car driven for 64,400 km (40,000 miles) of durability distance accumulation. The durability testing was halted at this point because of funding limitations.

II. TEST EQUIPMENT AND PROCEDURES

This section covers the equipment and procedures used to obtain and analyze the gaseous exhaust emissions, exhaust sulfates, and other unregulated emissions measured during both Phase I and Phase II of this project. Also covered are the procedures for durability distance accumulation and analysis of the fuels used during the project.

A. General Emission Test Procedures

The 1978 light-duty Federal Test Procedure (FTP) without evaporative emissions, was followed in terms of procedure and equipment as much as possible for all tests. It is assumed that the reader is familiar with this test procedure. If not, it can be found in 40 CFR Part 86. The latest recodification was published in the Federal Register, Volume 42, Number 124, dated June 28, 1977.

The gaseous emissions of hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NO_x) were collected and analyzed using the procedures of the light-duty FTP. The tests were performed on a Clayton chassis dynamometer, model EC-50, with the vehicles manually driven. A Positive Displacement Pump Constant Volume Sampler (PDP-CVS), with a nominal capacity of 350 CFM was used. To collect the sulfate sample, the usualy CVS system was modified by inserting a three meter long tunnel, approximately 21 cm in diameter, between the CVS room air filter box and the entrance to the CVS heat exchanger. Figure 1 shows various views of the test area, CVS system and the analysis instruments for the bagged gaseous emissions.

There were three main driving cycles used during this project. The first was the driving cycle used in the light-duty FTP, known as the LA-4 cycle or the Urban Dynamometer Driving Schedule (UDDS). The second was the Highway Fuel Economy Test (HFET) cycle. The third cycle, developed specifically as a sulfate test cycle, is called the Congested Freeway Driving Schedule (CFDS). The speed versus time traces of these three cycles are shown in Figure 2.

B. Collection and Analysis of Unregulated Emissions

This section discusses the collection and analysis of exhaust sulfate, nonmethane hydrocarbons, hydrogen cyanide and ammonia; the unregulated emissions measured as part of this project.

Sulfate

The exhaust sulfates were collected as sulfuric acid on 47 mm Fluoropore*

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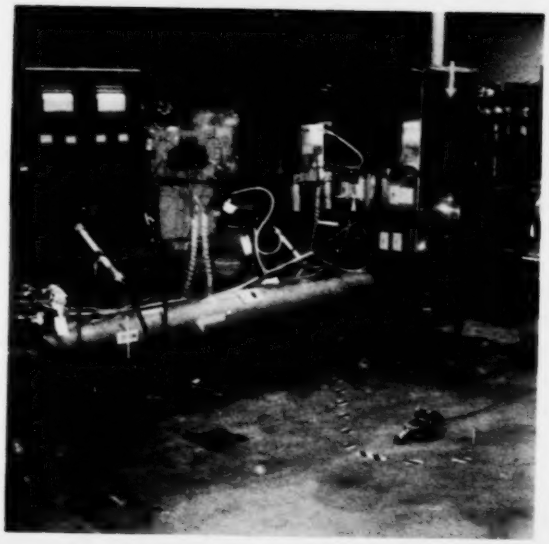
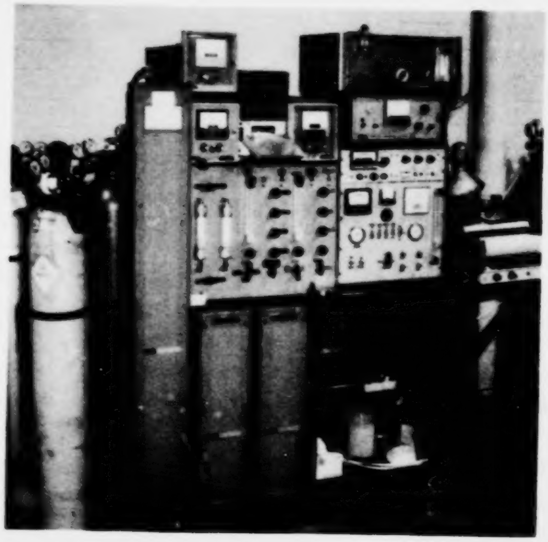
*Fluoropore is a registered trademark of the Millipore Corporation. Fluoropore filters are made of PTFE (Polytetrofluorethylene) bonded to polyethylene net.

General View of Test Area

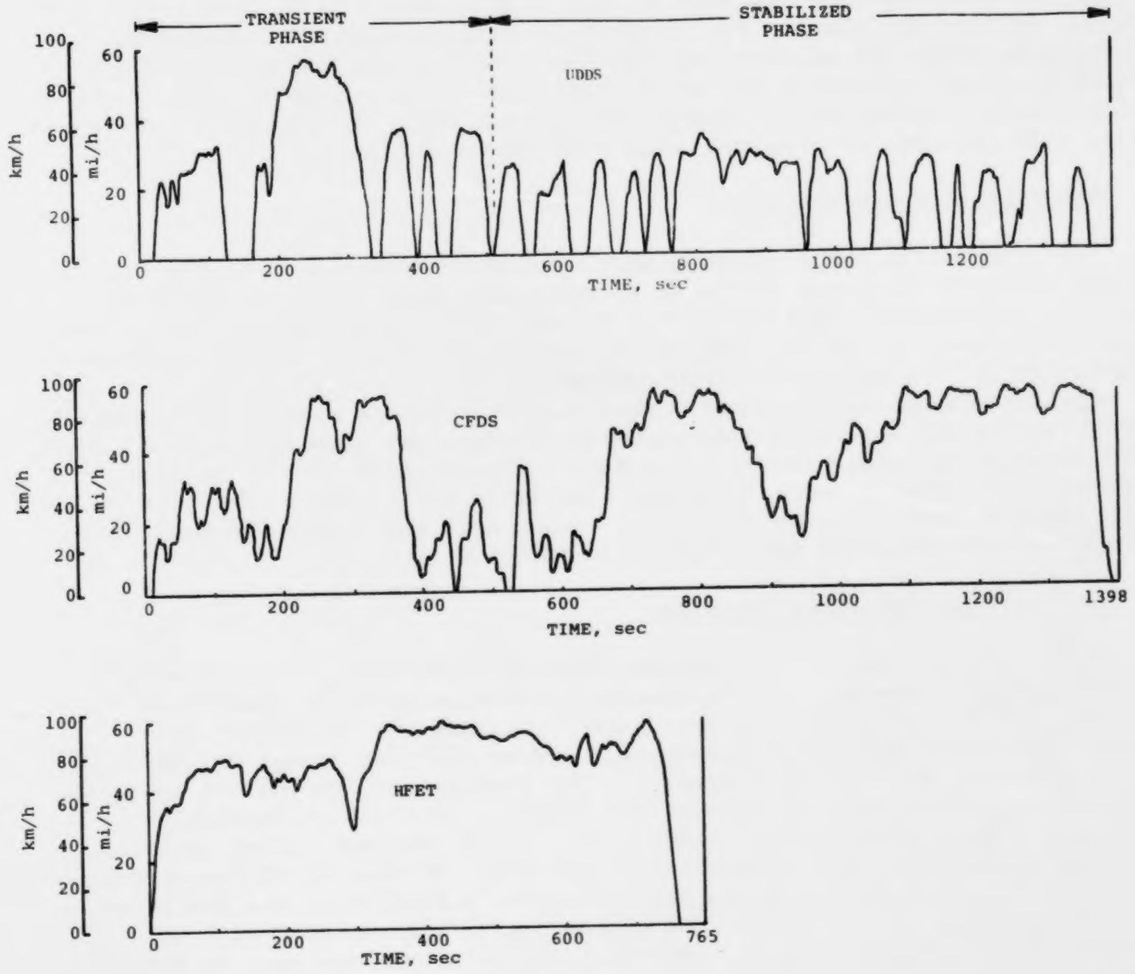


Dilution Air Filter Box and Sulfate Tunnel



Emission Analyzers for Bagged Gaseous Emissions

Figure 1. Emissions collection and analysis equipment



Cycle	Avg. Speed kph (mph)	Distance km(miles)	Time Seconds
HFET	77.55(48.20)	16.48(10.24)	765
UDDS	31.70(19.70)	12.07(7.50)	1372
CFDS	55.96(34.78)	21.74(13.51)	1398

Figure 2. Speed vs. time traces of FTP, HFET and CFDS driving cycles

filters with 0.5 µm pore size. The samples were obtained isokinetically using a probe centered in the 21 cm diameter tube. Figure 3 is a schematic of the collection system.

The amount of sulfate deposited on the filter is determined by the barium chloranilate analysis (BCA) procedure developed by EPA.(12) A complete description of this procedure as used at SwRI, can be found in Reference 8. Briefly, it involves placing the filter in a 60/40 mixture of isopropanol and water to place the sulfates in solution. Part of the solution is fed through a column containing barium chloranilate, which reacts with the sulfates forming barium sulfate and releasing chloranilic acid. The amount of chloranilic acid released is measured using a UV Spectrophotometer.

Non-Methane Hydrocarbons

Over the years, there has been much discussion concerning whether or not methane should be included in the HC emission standards since it does not enter in the classical smog reaction. On some tests during this project, the amount of methane in the bag samples was determined using a method developed by EPA.(13-15) The methane is then subtracted from the total FID HC to give the total nonmethane hydrocarbons. This procedure uses a single gas chromatograph with a multiple column arrangement and dual gas sampling valves. The timed sequence selection values allow baseline separation of air, methane, ethylene, acetylene, propane, propylene, benzene, and toluene. For this project, only the methane value was used. Both sample and background bags were analyzed to determine the net hydrocarbon emission rates.

Hydrogen Cyanide (Total Cyanide)

There is a possibility of hydrogen cyanide (HCN) being produced with a threeway catalyst system.(16) Therefore, HCN was measured in Phase I on the 1977 Fury during the durability test phase. Because the collection and analysis procedure for HCN will also collect any cyanogen (C_2N_2) present, the results are expressed as total cyanide. The complete collection and analysis procedure can be found in Reference 17. Briefly, it involves collecting a continuous sample of the dilute exhaust in a glass impinger filled with 1.0N potassium hydroxide. Upon completion of the test, an aliquot of the absorbing reagent is treated with KH_2PO_4 and Chloramine-T. A portion of the resulting cyanogen chloride is injected into a gas chromatograph equipped with an electron capture detector (ECD). External CN^- standards are used to quantify results.

Ammonia

It is possible for a threeway catalyst to produce ammonia at rich A/F ratios. At rich A/F ratios, there is a lack of oxygen and NO_x is converted to NH_3 rather than N_2.(18) For this reason, ammonia was measured on the 1977 Fury threeway catalyst car tested in Phase 1 during the durability testing. The procedure is to pass a continuous sample of the dilute exhaust through a glass impinger containing dilute sulfuric acid. The ammonia is collected in the impinger as NH_4+. The solution from the impinger is analyzed for ammonia using an ion chromatograph, with the concentration being determined by com-

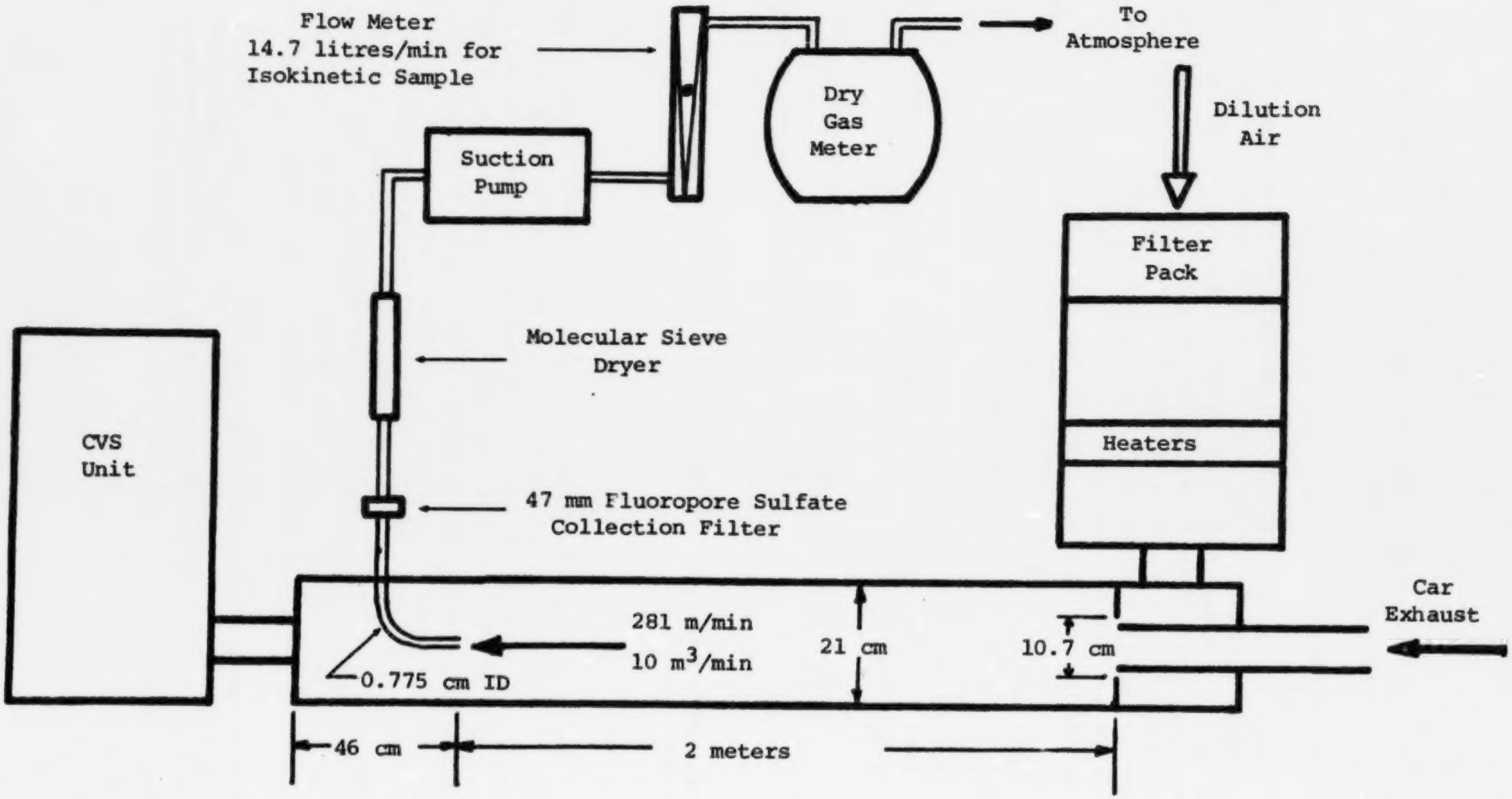

Flow Meter
14.7 litres/min for
Isokinetic Sample
To
Atmosphere
Dry
Gas
Meter
Dilution
Air
Suction
Pump
Filter
Pack
Heaters
Molecular Sieve
Dryer
CVS
Unit
47 mm Fluoropore Sulfate
Collection Filter
Car
Exhaust
281 m/min
10 m³/min
21 cm
10.7 cm
0.775 cm ID
46 cm
2 meters

Figure 3. Schematic of sulfate sample collection system

parison to standard solutions. The complete procedure for collection and analysis of exhaust ammonia can be found in Reference 17.

C. Durability Test Procedures

During both Phase I and Phase II of this project, the emission control systems being evaluated were tested for durability by driving the cars on which the systems were installed in a specified manner for a specified distance. The basic durability distance accumulation procedure is specified in 40 CFR Part 86, paragraph 86.080-26 and Appendix IV to Part 86. It is often refered to as the "AMA driving schedule." The durability driving schedule listed in Appendix IV of Part 86, was modified by MSAPC Advisory Circular 37, to permit lower speeds on the last two laps of the schedule, allowing operation within the speed limit on public roads. The durability driving course used at SwRI is shown in Figure 4. During the durability testing in both Phase I and Phase II, the 52.3 km driving schedule was driven repeatatively for two 8-hour shifts per day, 5 days per week. With allowance for breaks and meals, approximately 640 km (400 miles) could be accumulated per day. A tachograph was installed in each vehicle undergoing distance accumulation to insure that the driving schedule was being driven correctly.

Oil level and tire pressure were checked at every shift change. All engine and driveline system fluid levels were checked weekly. Scheduled maintenance was performed at 12070 km (7500 miles) intervals in accordance with the applicable vehicle service manual.

Emission tests were performed every 8050 km (5000 miles) during the distance accumulation.

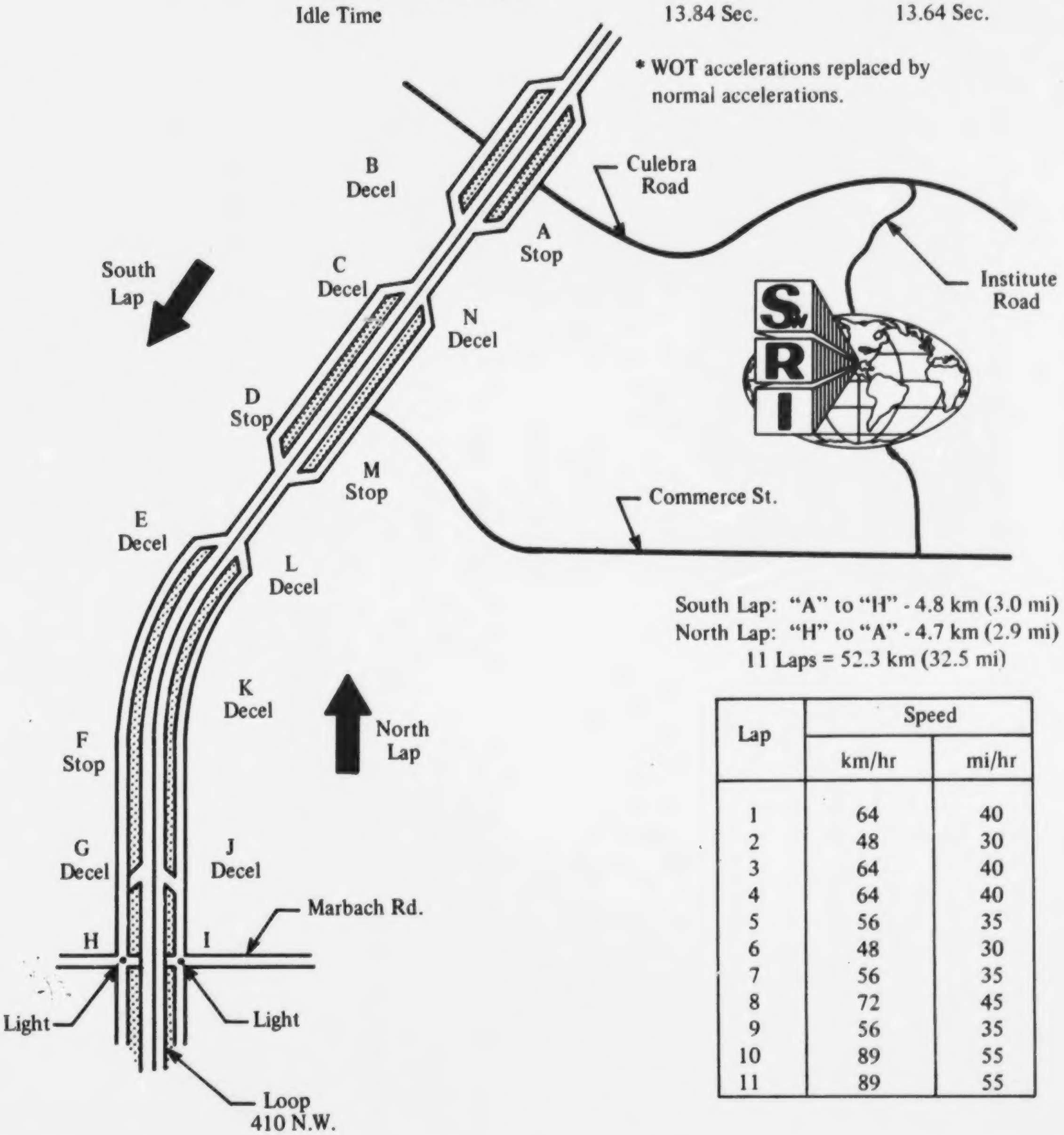
D. Fuels

Two types of fuels were used during the project. The first was a commercially available unleaded regular gasoline with the sulfur level increased to 0.03 weight percent by the addition of thiophene. This fuel was used during the development and optimization testing in both Phase I and II and for distance accumulation during the durability testing of Phase I. Since considerable fuel was required for durability testing, two batches of fuel were used. The first, designated EM-237-F, was used for development and optimization tests in Phase I, and the first 16100 km of distance accumulation on the 1977 Fury and the first 8050 km on the 1975 Nova. The second batch, designated EM-344-F, was used for the remaining durability distance accumulation in Phase I and all distance accumulation in Phase II.

The second fuel was a specially blended emissions test fuel, meeting all of the specifications for the light-duty FTP. This fuel, designated EM-274-F, was used for the final optimization tests on both cars in Phase I It was used for all emissions tests in Phase II. An analysis of each fuel used is presented in Table 1.

Driving Mode	Events Per Mile 55 mph Top Speed SwRI Course*	 AC No. 37
Stops	1.02	1.01
Normal Accelerations from Stop	1.01	0.91
Normal Accelerations from 20 mph	1.11	1.11
Wide-Open Throttle Accelerations and Fast Deceleration	0.00	0.10
Idle Time	13.84 Sec.	13.64 Sec.

* WOT accelerations replaced by normal accelerations.


B Decel
Culebra Road
A Stop
South Lap
C Decel
N Decel
Institute Road
SwRI
D Stop
M Stop
Commerce St.
E Decel
L Decel
K Decel
North Lap
F Stop
G Decel
J Decel
Marbach Rd.
H
I
Light
Light
Loop 410 N.W.

South Lap: "A" to "H" - 4.8 km (3.0 mi)
North Lap: "H" to "A" - 4.7 km (2.9 mi)
11 Laps = 52.3 km (32.5 mi)

Lap	Speed	
	km/hr	mi/hr
1	64	40
2	48	30
3	64	40
4	64	40
5	56	35
6	48	30
7	56	35
8	72	45
9	56	35
10	89	55
11	89	55

Figure 4. SwRI Durability Driving Course

TABLE 1. FUEL ANALYSIS

Property		Commercially Available Unleaded Gasoline		Gasoline Blended by Howell Refinery
		Development and Evaluation EM-237-F	Service Accumulation EM-344-F	Emissions Testing EM-274-F
Distillation Range, °C (°F)	IBP	32 (89)	36 (97)	32 (89)
	10 Pct	52 (125)	54 (129)	56 (132)
	50 Pct	103 (217)	100 (212)	106 (222)
	90 Pct	107 (338)	164 (328)	159 (319)
	EP	211 (412)	197 (386)	201 (394)
	Pct Recovered	97.9	97.5	97.6
	Pct Residue	1.3	1.0	1.0
R.V.P., kPa (pounds)		62.7 (9.10)	61.4 (8.9)	57.2 (8.3)
Gravity, g/ml (°API)		0.739 (59.9)	0.745 (58.4)	0.751 (56.9)
Lead, mg/litre (g/gallon)		<1.3 (<0.005)	0.3 (0.001)	0.3 (0.001)
Sulfur, weight percent		0.03	0.03	0.03
Hydrocarbon Composition, percent				
	Aromatics	26.4	28	33.7
	Olefins	2.9	8	0.9
	Saturates	70.7	64	65.4
Phosphorus, mg/litre (g/gallon)		<0. (<0.001)	0.05 (0.0002)	0.00 (0.0000)
Octane Number	Research	91.4	91.6	97.1
	Motor	84.5	83.2	87.6

III. PHASE I - INITIAL EVALUATION, OPTIMIZATION AND DURABILITY TESTING OF LOW SULFATE SYSTEMS

This project conveniently divides into two phases. The first phase includes all activities to meet the objective of the project: the selection of emission control systems, evaluation, optimization and durability testing of two low sulfate emission control systems. This first phase used a 1975 Chevrolet Nova and a 1977 Plymouth Fury as test cars. Because the two systems being tested did not meet the durability goals, the durability testing was halted. Phase II of the project involved the selection and testing of a different emission control system on another test vehicle. This section of the report covers the work done under Phase I of the project.

III-1. EMISSION CONTROL SYSTEM AND VEHICLE SELECTION

The first task of the project was to consider a variety of possible emission control systems proposed for use in meeting future emission standard and choose two or three for further evaluation. The criteria for the initial evaluation was the possibility of meeting gaseous emissions levels of 0.26 g/km (0.41 g/mile) HC, 2.11 g/km (3.4 g/mile) CO, and 0.93 g/km (1.5 g/mile) NO_x while maintaining low sulfate emissions. During the course of the project, the 1977 amendments to the Clean Air Air were passed, setting the NO_x limits for 1981 and beyond at 0.61 g/km (1.0 g/mile) NO_x. While the systems had already been chosen at this time, the NO_x goal was changed at that time to 0.61 g/km to conform to the new statuatory limits.

A variety of emission control systems were considered for evaluation, including oxidation catalyst with modulated air; threeway catalyst with feedback fuel system; lean burn system without oxidation catalyst; "start only" catalyst systems; and high temperature exhaust systems. Of these systems, three were chosen by EPA at the beginning of the project for further evaluation. The three systems chosen were the oxidation catalyst with modulated air, high temperature exhaust, and threeway catalyst with feedback controlled carburetor. Two of these systems would be selected for durability testing.

Initially, it was planned to obtain two new "matched" vehicles to use as test cars for the emission control systems. However, when the systems for evaluation were chosen it became obvious that availability of system hardware would dictate the selection of the test cars. Thus, instead of two "matched" cars to which systems would be fitted, each system would be installed on a test car suited for that system. This approach not only resulted in a better match of emission control systems and test car, but it also conserved project funds.

The high temperature exhaust system would require exhaust port liners. After a search of moderate effort, it was found that the Chevrolet 5.74 litre (350 in^3) engine was the most readily adaptable to port liners. Since the EPA had, from another project, a 1975 California model Chevrolet Nova with a 5.74 litre engine equipped with lined exhaust ports, it was decided to use this car for the high temperature exhaust system test car.

While selecting the system components for the air modulation system, it was realized that the 1975 Nova would also be a suitable test car for that system. Since it was believed that the 1975 Nova had accumulated only a few thousand kilometers, and could accommodate either the high temperature exhaust of air modulation system, it was decided to use it as one of the test cars.

At the project inception, there were no intermediate size cars in production with threeway catalysts and feedback fuel control systems. However, Chrysler Corporation agreed to loan EPA a 1977 Fury, equipped with a 5.90 litre (360 in^3) V8 engine and an experimental Holley feedback carburator and fuel control system. To complete the system, two 1475 cc (90 in^3) threeway catalysts with a 5 to 1 platinum/rhodium ratio were supplied to EPA by Engelhard Industries. Thus, the 1977 Plymouth Fury became the second test car for the project.

A. 1975 Chevrolet Nova

The 1975 Nova test car is described in Table 2. After the car had been delivered to SwRI, it was discovered that some of the engine systems had been considerably modified during its use on a previous EPA project. The changes are discussed in the final report of that project.[19] Prior to use of the car in this study, most of the systems were returned to stock configuration. However, some were left in the "as-received" configuration. The system changes are listed in Table 3.

B. 1977 Plymouth Fury

A description of the 1977 Plymouth Fury is also included in Table 2. The car was a stock 1977 Fury, except for the fuel system, catalyst, and the fact that the EGR and OSAC systems were, while installed, purposely not operational. An airpump was also installed, but not operational. The air pump, EGR and OSAC system were included for possible use during optimization testing.

The feedback controlled carburetor fuel system supplied with the car was an experimental system developed by Holley carburetor. The pictorial schematic in Figure 5 shows the elements of the basic system. The O_2 sensor, located in the exhaust stream between the engine and the catalyst, produces a voltage of about 800 millivolts in the absence of oxygen in the exhaust. This voltage decreases to zero as the oxygen in the exhaust stream increases from 0 to 1.5 percent.

The voltage signal from the sensor is the prime control input to the electronic control unit which provides a square wave output signal of constant frequency, but of variable band width depending on the O_2 sensor voltage. The ECU is designed so that at low values of oxygen in the exhaust (highest level of sensor voltage output), the output signal band width is the greatest. Conversely, as the oxygen concentration increases in the exhaust and the sensor voltage decrease, the band width decreases.

This variable width output signal operates the vacuum control valve, which serves to modulate the vacuum that is applied to the carburetor from the vacuum storage canister. Because the "on time" of the value is a function of O_2 sensor signal, the modulated vacuum resulting from variable "on time" is also a function of O_2.

TABLE 2. DESCRIPTION OF TEST CARS

Manufacturer	Chevrolet	Plymouth
Model	Nova	Fury
Model year	1975	1977
Vehicle Identification No. (VIN)	1X27L5L119711	RH41K7A115764
Emission family designation	11K43	N.A.
Engine displacement, litres (cu.in.)	5.74(350)	5.90(360)
No. of cylinders and configuration	V8	V8
Transmission	3 speed auto.	3 speed auto.
Ignition timing	6° BTC	10° BTC
Idle rpm	600	700
Carburetor	Rochester "Quadajet"	Holley Model 2245
Rear axle ratio	3.08	2.45
Tires	ER78-14	H78-15
Stock Emission Control System	"California" (Air pump, ox.cat.& EGR)	N.A.
Inertia weight class (lbs)	3500	4500

TABLE 3. COMPONENT CHANGES TO 1975 NOVA

Component	Contract 68-03-2161 Modifications*	Configuration for Contract 68-03-2481		
		Stock	Baseline	High Temp. Exhaust System
1. Exhaust manifolds	Replaced with 1973 prod. nodular iron manifold, #34622 & 364753	Reinstalled stock manifolds	Stock manifolds	Returned to '73 manifolds, #34622 & 364753
2. Exhaust piping	Removed, installed "NO_x canisters"	Reinstalled stock pipes	Installed modified pipes	Modified pipes
3. Oxidation catalyst	Removed, installed Engelhard PTX-IIC modified with air injection tube	Reinstalled stock catalyst	Installed 2 monolith catalysts	2 Monolith Catalysts
4. Air injection piping system	Removed piping, reinstalled new piping system with timer controlled solenoid and temp. control in lines to exhaust ports	Replumbed to stock configuration	Stock configuration	Stock configuration
5. Transmission cross member	Replaced with 1973 Impala cross-member	Retained	Retained	Retained
6. Transmission control rod	Modified	Retained	Retained	Retained
7. Ignition system	Added a time controlled ignition retard with vacuum overide (stopped vacuum signal to dist. for 45 sec. after start) retarding ignition at start	Returned to stock configuration	Stock configuration	Stock configuration
8. Choke actuator	Replaced with Delco electric choke with resistor added	Returned to stock configuration	Stock configuration	Stock configuration
9. Oil pressure sending unit	Replaced with Cadillac unit #6464144	Replaced with stock unit	Stock unit	Stock unit
10. Early Fuel Evap. (EFE) System	Disabled by wiring valve open and removing vacuum actuator	Returned to stock configuration	Stock configuration	Stock configuration

TABLE 3 (Cont'd). COMPONENT CHANGES TO 1975 NOVA

11. Carburetor	(a) replaced with complete 49 State carburetor #7045202	(a) retained	(a) retained	(a) retained
	(b) replaced main jets and metering rods (new rods of constant diameter)	(b) retained	(b) retained	(b) retained
	(c) increased size of channel restrictors	(c) retained	(c) retained	(c) retained
	(d) To eliminate lean A/F ratio excursions and minimize extremely rich excursions, changes may have been made to accelerator pump actuation, strobe, nozzle diameter, power valve orifice and actuation vacuum	(d) retained	(d) retained	(d) retained
	(e) Initial choke opening, cold idle speed and choke time adjusted to give 4-5% CO at start	(e) returned to Mfgr's specifications	(e) Mfgr. spec	(e) Mfgr. spec
12. PCV system	Installed 1.6 MM orifice in line	Retained	Retained	Retained
13. EGR valve	Installed dual diaphragm EGR valve	Retained	Retained	Retained
14. Cylinder heads	Replaced with heads with exhaust port liners	Returned to stock head	Reinstalled head with port liners	Port lined heads

*Vehicle originally a 1975 California Nova with 5.74 litre engine (family LM-1); California emission controls including single-diaphragm EGR valve, air pump and associated plumbing and a 4261 cc pelleted cat.; HEI ignition and automatic transmission.

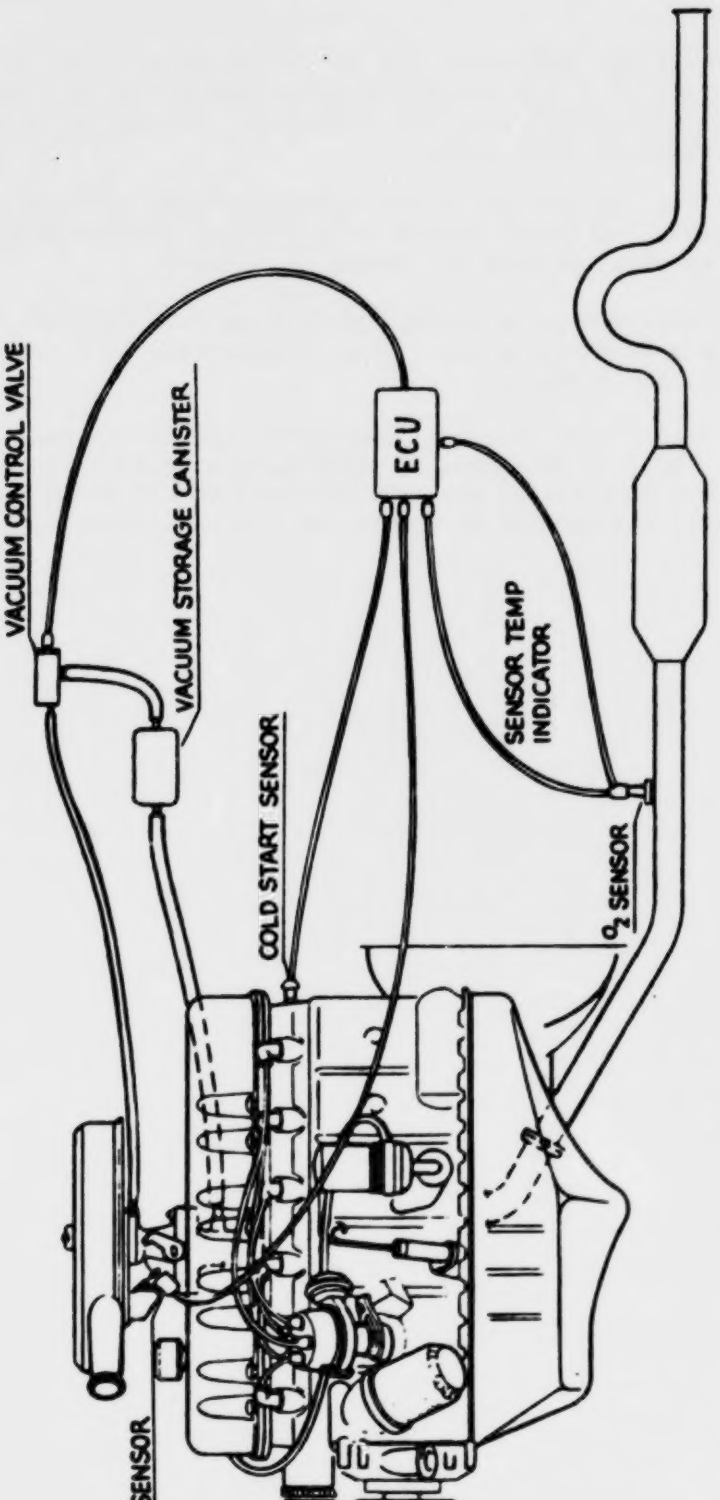

VACUUM CONTROL VALVE
VACUUM STORAGE CANISTER
ECU
COLD START SENSOR
SENSOR TEMP INDICATOR
O_2 SENSOR
WOT SENSOR

Figure 5. Holley feedback carburetor engine system

The sensor temperature indicator, the cold start sensor, and the wide-open-throttle sensor shown in the schematic, can override the O_2 sensor signal to the ECU so that richer air/fuel ratios are provided at wide-open-throttle and cold operating conditions.

Figure 6 shows the two systems in the carburetor that are controlled by the modulated vacuum. The idle system is controlled by providing a variable air bleed in parallel with the normal air bleed.

Control of the main system is accomplished by varying the fuel orifice in parallel with the main metering jet. This construction is a refinement of today's power enrichment system.

In operation, when a high vacuum is applied to the carburetor, it will tend to meter lean. This is accomplished when the solenoid has a high percentage of "on" time. Conversely, when the solenoid is off or operating at a low "on" time level, the control vacuum is low and the carburetor metering will enrichen.

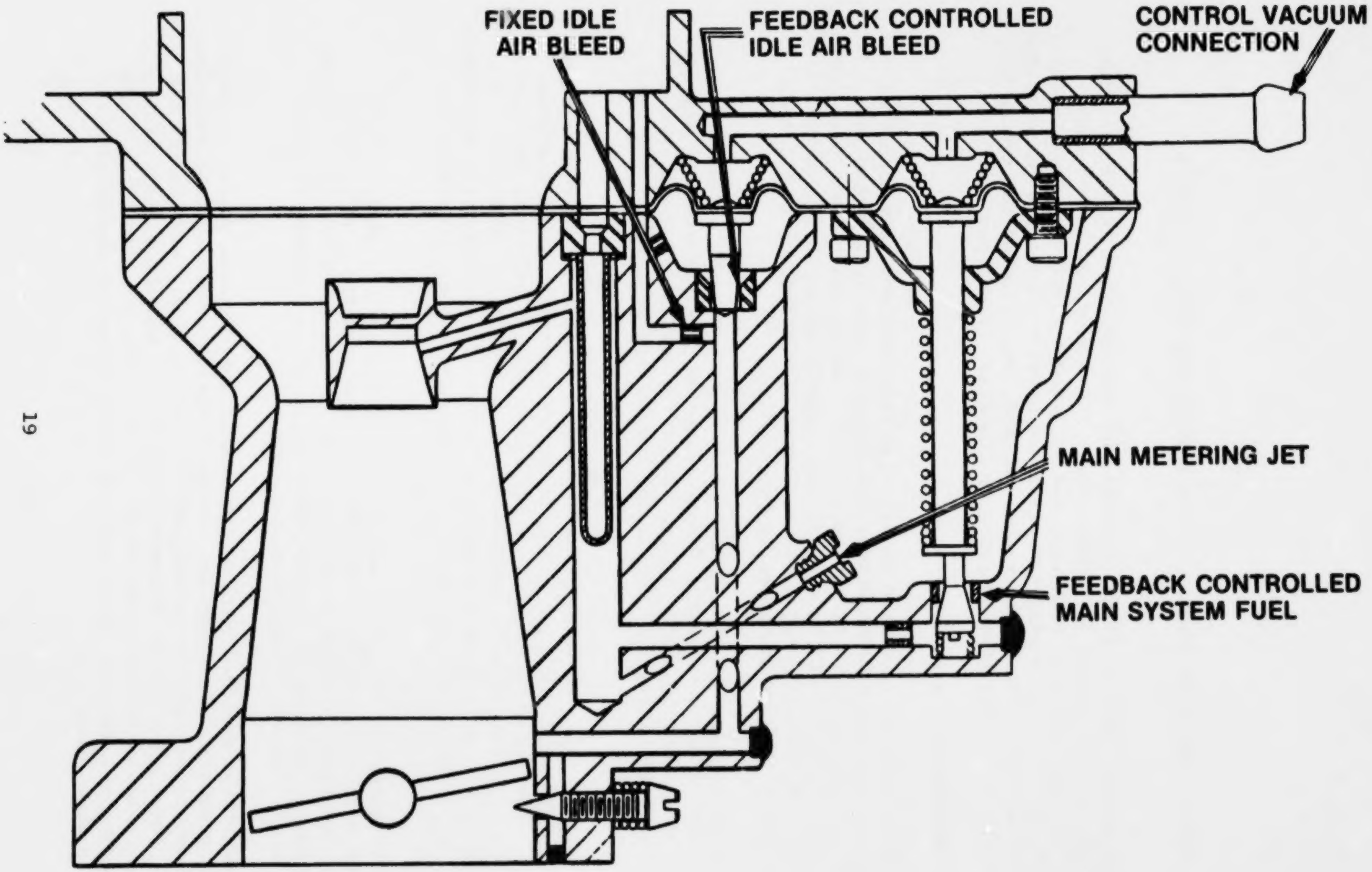

FIXED IDLE
AIR BLEED
FEEDBACK CONTROLLED
IDLE AIR BLEED
CONTROL VACUUM
CONNECTION
MAIN METERING JET
FEEDBACK CONTROLLED
MAIN SYSTEM FUEL

Figure 6. Feedback carburetor cross-section

III-2. EMISSION CONTROL SYSTEM DEVELOPMENT AND EVALUATION

This section covers the development and evaluation of two of the three low sulfate systems chosen for evaluation. The systems evaluated were: an oxidation catalyst with modulated air injection (referred to as the "air modulation system") and a high temperature exhaust system. The third system, a threeway catalyst with feedback fuel control, was selected for system optimization and durability testing prior to the start of the project.

A. Air Modulation System Development

Previous studies conducted at SwRI had indicated that the amount of air injected into the exhaust before the catalyst greatly affected the amount of sulfate produced by the catalyst.(7) While bench tests using SO_2 did not show changes in sulfate level above approximately two percent,(20,21) theoretical considerations show that a significant reduction in sulfates should be possible with decreases in injected air.(22)

In order to meet the 1981 HC and CO emission standards a catalyst air injection system may be required for an oxidation catalyst with the engine operating at conventionsl A/F ratios. Thus, for low HC and CO emissions a high oxygen level is required, while for low sulfate emissions a low oxygen level is required.

In current catalyst air injection systems, the air injected is a function of engine speed only, with the air pump output increasing as engine speed increases. For the catalyst to have sufficient air at all operating conditions, a great deal of excess air is produced for some operating conditions. The purpose of an air modulation system is to tailor the air injection to provide air only in the amount needed at any operating condition, minimizing the excess oxygen and thus the sulfate emissions.

Investigation of HC and CO emissions from carbureted gasoline fueled engines at various operating conditions indicate that for a given speed, emissions generally increase with power.(23) If the amount of air injected could be made a function of engine power, it would be possible to more closely tailor the air injection to catalyst need.

Since intake manifold vacuum is an indication of engine power, it was the first parameter considered for a control signal. Using a vacuum actuated valve it should be possible to modulate the amount of air supplied to the catalyst. Work done at G.M. Research Laboratories had shown successful air modulation using a control valve on the inlet of the air pump.(24) It was therefore decided that the first approach would be to try controlling the air at the pump inlet.

A control valve was designed and built using manifold vacuum as the valve actuator. The valve was then tested on an air injection system. Because of air leakage into the pump through shaft seals, etc., it was not possible to achieve a sufficient reduction in discharge flow.

The next approach was to control the air pump discharge flow. Another air modulation valve was built by modifying a standard G.M. air pump diverter valve. Figure 7 shows the standard G.M. diverter valve and the valve modified for air modulation. This valve was installed on the test engine and performed in a satisfactory manner. Figure 8 shows the percent flow versus vacuum level. The relationship of flow to manifold vacuum must, of course, be tailored to the car chosen as a test vehicle.

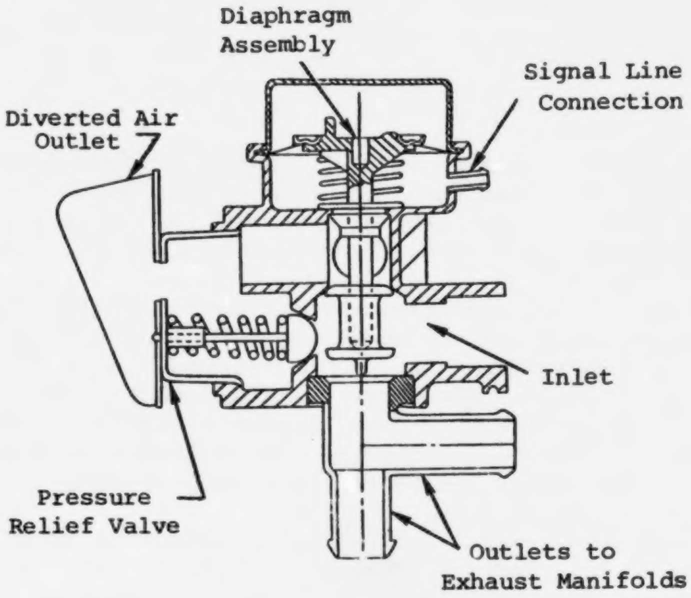
Since the 1975 Nova test car on which the system was to be installed, was not available at the time the system was ready for test, a rental car was obtained for use in the development of the air modulation system. Originally it was planned to use a Chevrolet Nova with a 5.74 litre (350 CID) engine to match the test car to be used for durability testing. However, a Nova with a 5.74 litre engine was not available from rental sources. A 1976 Chevrolet Impala with a 5.74 litre engine was chosen as the best available alternative.

The timing and idle speed were set to specification values at the test series shown in Table 4 run to obtain the stock condition emission levels. The results of this test series is shown in Table 5. The FTP emissions from the "stock" test were higher than the certification level for this car, however it was felt that the car would be satisfactory for evaluation and development of the air modulation system.

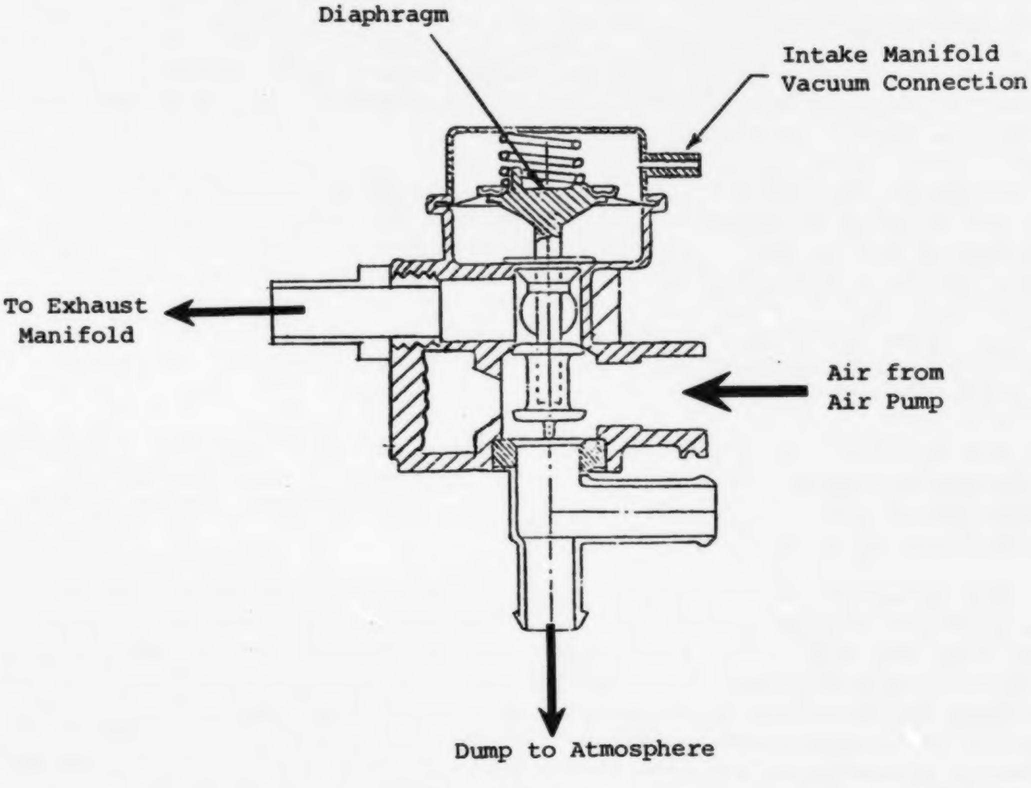
After the "stock" test, an air injection system, including air pump, necessary plumbing, and exhaust manifolds with air injection ports, was installed on the engine. The stock pelleted catalyst was removed. The exhaust system was modified to accommodate a monolith catalyst in the exhaust from each cylinder bank. The monolith catalysts were new stock Ford catalysts (part no. D7AZ5E212) used with the 1977 LTD with 5.75 litre (351 CID) engine. The car was then driven 160 km (100 miles) to season the exhaust system.

A test series was run which was to be the baseline test with a standard air injection system. During the testing the catalyst exit temperature, engine rpm, intake manifold vacuum, CO before the catalyst, and O_2 behind the catalyst, were continuously recorded.

The CO emissions were reduced with the air injection system and the CFDS sulfate level increased. However, the sulfate level was still much lower than expected. The HC emissions were not reduced by the addition of the air injection system. The catalyst exit temperature was recorded during all tests and was found to be considerably higher than expected. The high catalyst exit temperature, together with the higher than expected HC emissions indicated an ignition system problem which was later found to be a spark plug wire arcing to the exhaust manifold. However, at this time it


Diaphragm Assembly
Signal Line Connection
Diverted Air Outlet
Inlet
Pressure Relief Valve
Outlets to Exhaust Manifolds

Standard G.M. Air Diverter Valve


Diaphragm
Intake Manifold Vacuum Connection
To Exhaust Manifold
Air from Air Pump
Dump to Atmosphere

Air Modulation Valve

Figure 7. Standard air diverter valve and air modulation valve

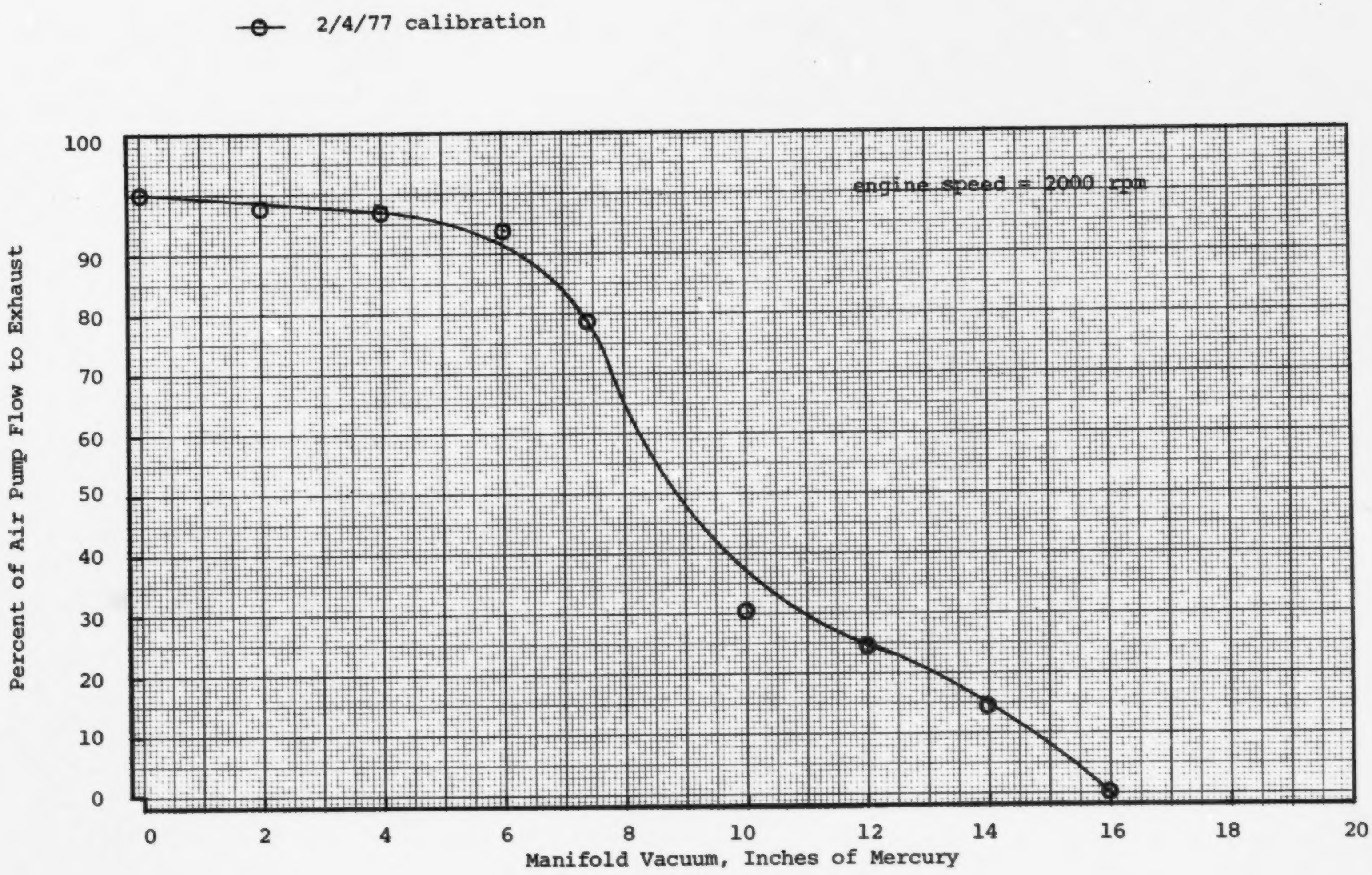


Figure 8. Air modulation valve calibration

TABLE 4. AIR MODULATION SYSTEM DEVELOPMENT TEST SEQUENCE

1. Precondition, LA-4
2. Soak 12 to 20 hours
3. FTP - 3 bags for gaseous emissions
4. Idle 1 minute (± 15 seconds)
    - (a) auto trans - drive manual - neutral
    - (b) place filter holder in tunnel
5. CFDS - 1 gaseous bag
   1 filter sample
6. Engine off - 5 minutes
7. HFET - 1 gaseous bag

TABLE 5. RESULTS OF AIR MODULATION SYSTEM DEVELOPMENT TESTS

Date	Configuration	Gaseous emissions g/km (g/mile)			H_2SO_4 gm/km (mg/mile)	Fuel ℓ/100 km (mpg)
		HC	CO	NO_x		
			FTP TESTS			
3/17/77	Stock	1.20(1.93)	10.84(17.44)	2.03(3.27)		20.34(11.60)
3/30/77	Baseline[a]	1.14(1.84)	1.95(3.14)	3.02(4.85)		21.66(10.90)
4/01/77	w/modulation	0.93(1.50)	2.18(3.51)	2.41(3.88)		19.33(12.17)
4/06/77	w/modulation	0.42(0.68)	4.34(6.98)	2.39(3.85)		19.62(11.99)
4/19/77	w/modulation	0.27(0.43)	8.89(14.30)	1.67(2.68)		19.26(12.21)
5/05/77	Baseline	0.14(0.23)	0.82(1.33)	2.22(3.58)		17.99(13.07)
5/10/77	Baseline	0.14(0.23)	0.81(1.30)	2.06(3.31)		17.55(13.40)
5/18/77	w/modulation	0.21(0.34)	0.95(1.53)	2.22(3.57)		16.01(14.69)
5/26/77	w/modulation	0.25(0.40)	1.25(2.02)	1.43(2.30)		18.82(12.50)
5/30/77	w/modulation	0.36(0.58)	3.62(5.82)	1.42(2.28)		18.28(12.87)
6/02/77	Baseline	0.28(0.45)	1.28(2.06)	2.09(3.36)		17.54(13.41)
6/06/77	Baseline	0.38(0.61)	1.02(1.64)	1.60(2.57)		17.54(13.41)
			CFDS TESTS			
3/17/77	Stock	0.19(.31)	5.59(8.99)	1.89(3.04)	0.16(0.26)	
3/30/77	Baseline	0.57(0.92)	3.41(5.49)	2.66(4.28)	3.30(5.31)	
4/01/77	w/modulation	0.50(0.80)	5.54(8.91)	1.85(2.98)	1.08(1.74)	
4/06/77	w/modulation	0.05(0.08)	1.37(2.20)	2.44(3.93)	1.39(2.24)	
4/19/77	w/modulation	0.10(0.16)	5.53(8.90)	1.69(2.72)	1.52(2.45)	
5/05/55	Baseline	0.05(0.08)	0.18(0.29)	2.44(3.92)	32.57(52.40)	
5/10/77	Baseline	0.08(0.13)	0.17(0.27)	2.07(3.33)	37.27(59.98)	
5/18/77	w/modulation	0.05(0.08)	0.42(0.68)	1.81(2.91)	3.72(5.99)	
5/26/77	w/modulation	0.08(0.13)	2.10(3.40)	1.13(1.83)	0.60(0.97)	
5/30/77	w/modulation	0.07(0.11)	1.04(1.67)	1.11(1.79)	0.53(0.86)	
6/02/77	Baseline	0.11(0.18)	0.19(0.31)	1.47(2.37)	80.49(129.51)	
6/06/77	Baseline	0.07(0.11)	0.11(0.18)	1.51(2.43)	62.29(100.22)	

[a] Baseline configuration is with catalyst air injection system without air modulation.

was felt that an initial check of the air modulation system was more important than an investigation of possible ignition system problems.

Following these initial tests, a total of six development tests on the air modulation system and four additional baseline tests with standard air injection were performed. The development testing proceeded in three steps:

1. Idle A/F adjusted to specifications, new spark plugs and first schedule of air modulation valve prior to tests on April 1 and April 6.

2. Cold start delay in air modulation additional EGR, and ignition system problem corrected prior to test series on April 19.

3. In addition to those changes in (2), installation of a centrifugal clutch on the air pump prior to tests on May 26 and May 30.

Baseline tests with a standard air injection system were run between steps 1 and 2, and following the completion of the development testing. The test results from all tests are listed in Table 5.

As the first step in the system development, the air modulation valve was inserted in the air injection system between the air pump diverter valve and the exhaust manifold air injectors and a test series run on April 1, 1977. Following the test series, an air modulation valve leak was corrected, new spark plugs installed, and the idle A/F ratio adjusted to specification using the "lean drop" method. The "lean drop" method utilized the fact that engine speed will vary with A/F ratio, at a constant throttle setting. For this case throttle setting is at idle (throttle closed). The idle mixture screws are turned in all the way, then turned out, enrichening the mixture until the engine speed no longer increases. The curb idle throttle stop is adjusted to give an idle speed a certain amount above specification idle speed (usually 50-100 rpm). The mixture screws are then turned in, leaning the mixture, until the idle speed decreased to the specification valve. During the next test on April 6, 1977, the cause of the suspected ignition system malfunction was discovered. The number 8 spark plug was observed arcing through the boot to the exhaust manifold. The spark plug boot was replaced during the soak period of the FTP and testing continued. The hot start portion of the FTP produced much lower catalyst exhaust temperatures and HC levels. However, as can be seen from Table 5, the CO and NO_x levels were still considerably above the project goals.

Following the April 6 test, the raw exhaust gas traces were examined to determine if the air modulation valve was correctly scheduled. The manifold vacuum and engine speed traces from the FTP test without air modulation, run on March 30, 1977, were read every two seconds and the values punched on computer cards. A scatter plot of manifold vaccum and engine speed pairs was then obtained using a computer plotter. The plot is shown in Figure 9. The CO trace from the same test was examined and the CO levels above 1 percent manually plotted on the graph. The CO levels above 1 percent for the first three minutes are shown as unshaded symbols;

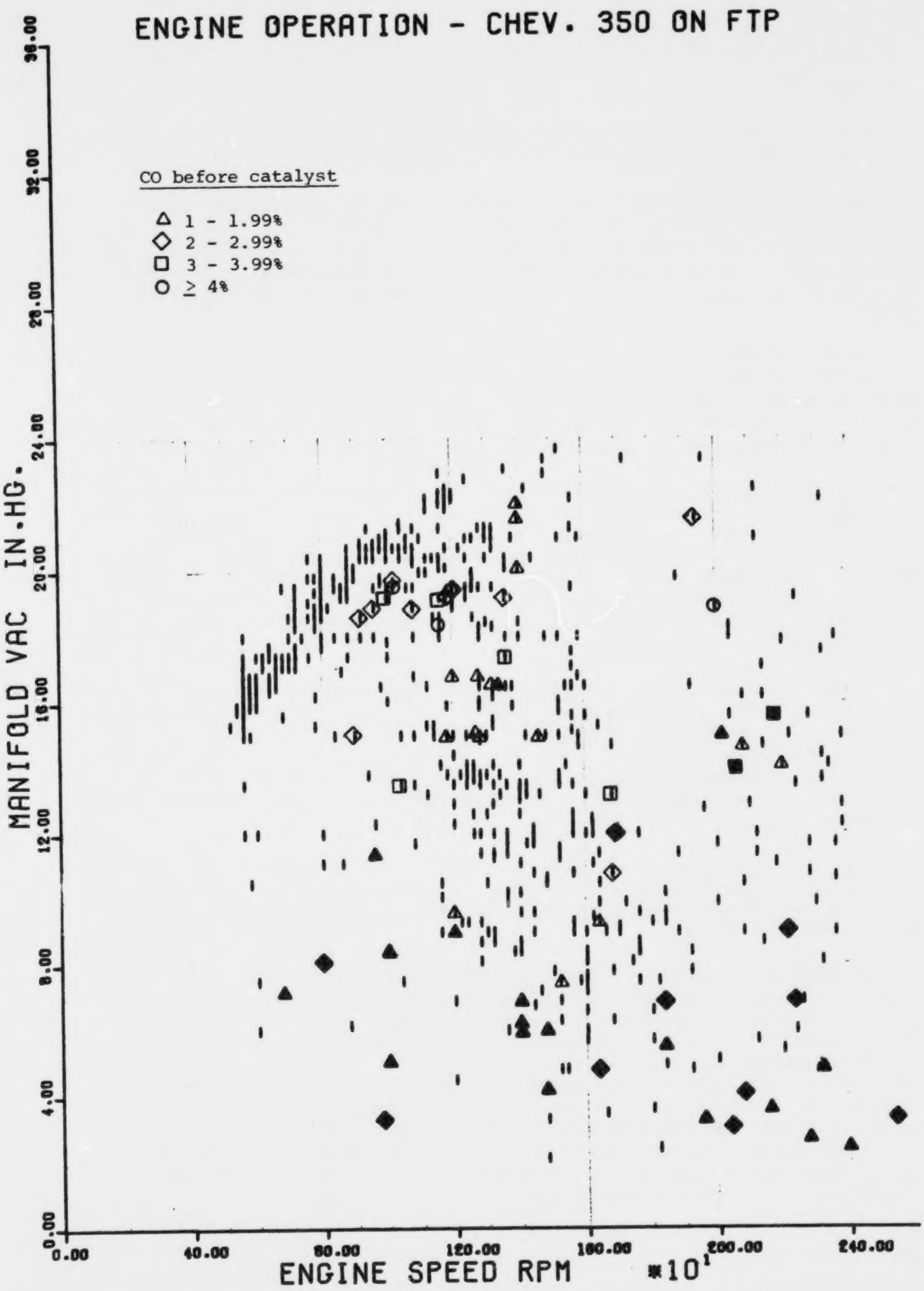


Figure 9. Manifold vacuum as a function of engine speed during FTP test on 1976 Impala

the remainder of the test as shaded symbols. The area of high CO was then compared to the modulation valve schedule, Figure 8.

Examination of Figure 8 and 9 indicated that the modulation valve schedule was satisfactory for that stage of development, but that full air to the catalyst was needed during approximately the first three minutes of the cold start. It also appeared that some air was needed at vacuum levels up to 18 to 20 inches of mercury at higher engine speeds, but not at idle speed.

To obtain full air injection during the cold start portion of the FTP, the vacuum chamber of the modulation valve needed to be opened to the atmosphere during the first three minutes of the cold start. To provide air at higher engine speeds, but not at idle, it was decided to use a centrifugal clutch on the air pump to disengage the air pump when the engine was idling.

Step two of the development process was to install and test the cold start hardware. The main part of the system was a solenoid valve installed in the vacuum to the air modulation valve. A time delay relay actuated the solenoid valve. The time delay relay was set at approximately 2-1/2 minutes. The vacuum system to the solenoid valve was plumbed in such a way that full air was admitted to the exhaust system until the solenoid was actuated, at which time the air injection was modulated by the manifold vacuum signal.

Also during this step, a dual diaphragm EGR valve was installed on the engine in an effort to reduce NO_x to the project goal. The dual diaphragm EGR valve is constructed such that for high intake manifold vacuum levels, as would be experienced in cruising, the valve opening is less than for low manifold vacuums obtained during accelerations. Thus, the valve is capable of providing more recirculation on acceleration than the standard EGR valve.

The next series of development tests was run on April 19, 1977. The test results, listed in Table 5, showed a reduction of HC and NO_x. Examination of the before catalyst CO trace revealed a need for further adjustment to the idle CO level.

At that point in the development testing it was felt that another baseline test with the standard air injection system should be run to evaluate the effects of catalyst seasoning in sulfate emissions. The car was first driven 161 km (100 miles) on suburban expressways as a quick mileage accumulation, then tested on May 5 and 10, 1977 using the FTP and CFDS test cycles. The sulfate emissions from the two CFDS tests averaged 34.92 mg/km, which is ten times the initial baseline CFDS sulfates. It was obvious that the lower sulfates from the initial CFDS baseline test with standard air injection were the result of having an unseasoned catalyst. Thus, the second baseline CFDS sulfate levels were used as the standard air injection system levels.

The third step of the development testing was to install the air pump centrifugal clutch. The centrifugal clutch used was a modified small gasoline engine clutch manufactured by Mercury Clutch Division of Aspro, Inc., Model No. GW8-30. It was modified to have the pulley as the driving element rather than the shaft. A cross-section sketch of the modified clutch is shown in Figure 10.

The time delay relay actuated solenoid valve in the vacuum line to the air modulation valve was replaced with engine coolant temperature switch identical to the EGR vacuum signal switch that is stock equipment on the car. This was accomplished by installing a pipe tee in the EGR switch location and fitting an EGR switch in both ends of the tee.

The air modulation system then consisted of three additional elements in a standard air injection system. These elements were:

- A centrifugal clutch on the air pump pulley sheave
- A manifold vacuum actuated air modulation valve
- A coolant temperature controlled switch in the vacuum line to the air modulation valve.

Figure 11 is a sketch of the system showing the various elements. After installing the system on the car, it was driven 161 km and tested on May 18, 1977 using the FTP and CFDS cycles. The CFDS sulfate emissions from this test was 3.7 mg/km. This large decrease in sulfate emissions was taken to indicate that the air injection system did indeed have potential as a method to reduce sulfate emissions. The complete results from these tests are also given in Table 5.

At this time, it was felt that the system was ready for the final demonstration test series: 805 km on the AMA durability driving schedule; a test series consisting of an FTP, CFDS, and HFET; 480 km on the AMA durability schedule; and a repeat of the test series. This was to be done with both the standard air injection system and the modulated air injection system. Since the modulated air injection system was installed on the car, it was tested first. The results of the replicate tests run on May 26 and 30, 1977 are shown in Table 5.

The sulfate levels from the CFDS were surprisingly low, being 0.60 mg/km for the first CFDS and 0.53 mg/km for the second CFDS. This is an average 98 percent reduction in sulfates from two previous tests with the standard air injection system.

The air modulation system was then removed from the test car. The emission control systems were then in stock 1976 Federal configurations except for:

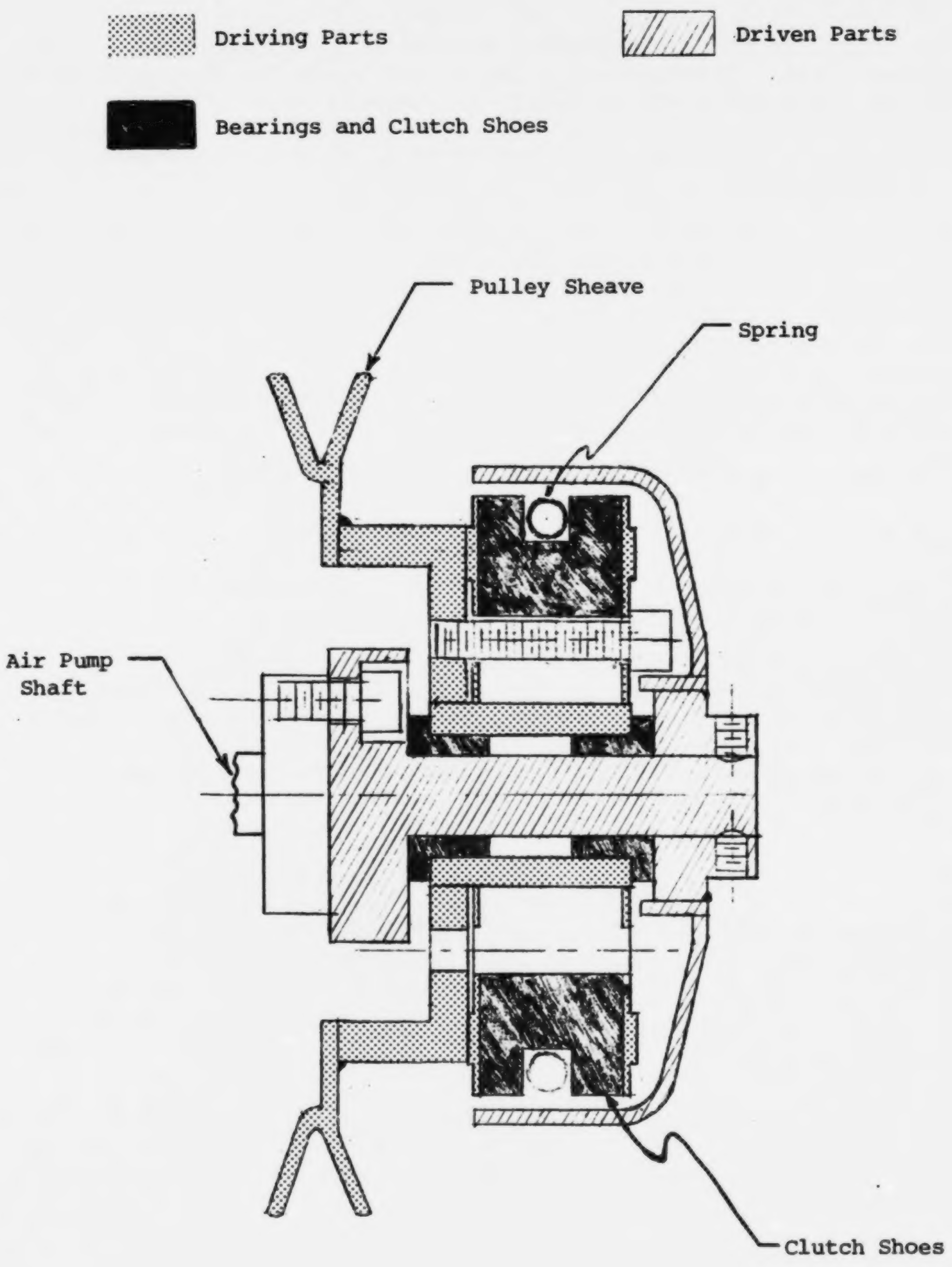
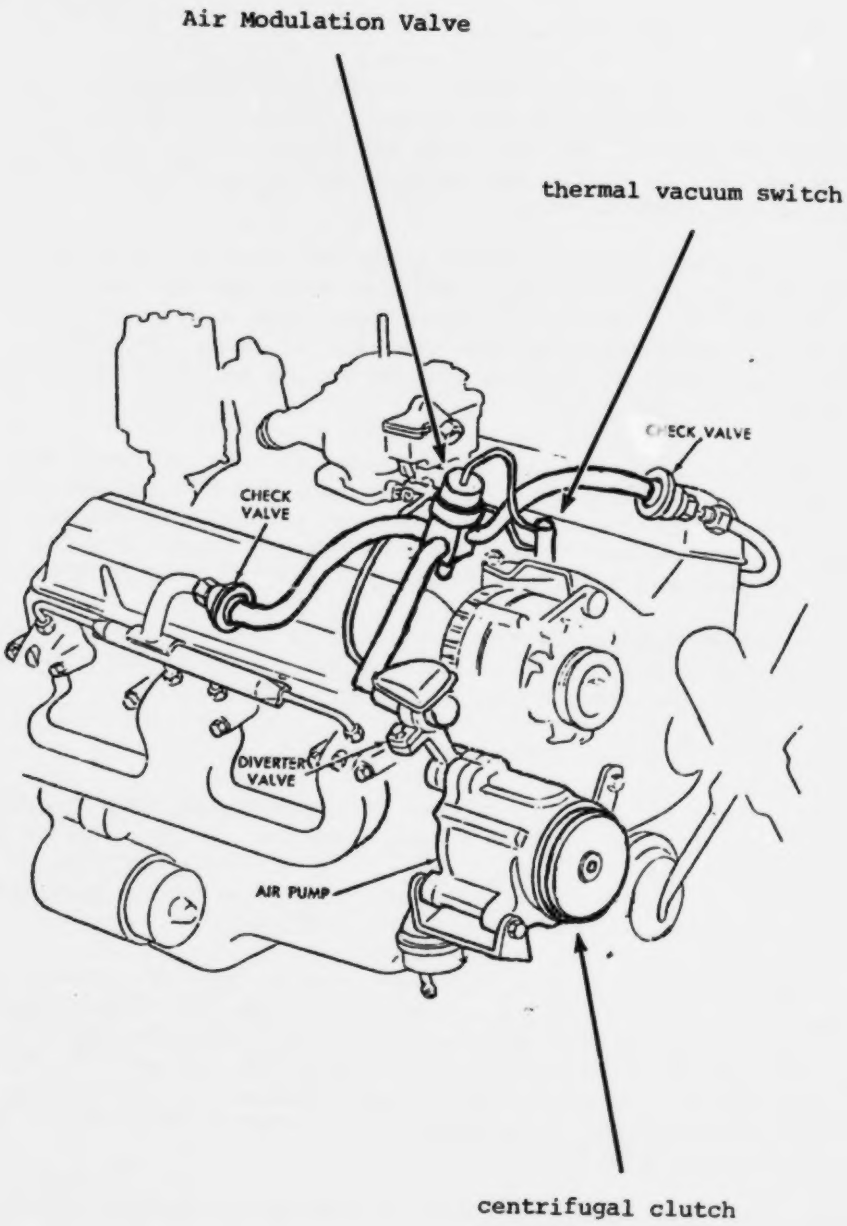

Driving Parts
Driven Parts
Bearings and Clutch Shoes
Pulley Sheave
Spring
Air Pump Shaft
Clutch Shoes

Figure 10. Cross section of centrifugal clutch


Air Modulation Valve
thermal vacuum switch
CHECK VALVE
CHECK VALVE
DIVERTER VALVE
AIR PUMP
centrifugal clutch

(items added to standard injection system are in large print)

Figure 11. Modulated air injection system

- a dual diaphragm EGR valve in the EGR system;
- two monolith catalyst in place of the one pelleted catalyst, and
- a standard air injection system.

With the car in this configuration, it was driven 805 km on the AMA durability driving schedule, then tested for sulfate and gaseous emissions. The test series consisted of an FTP, CFDS and HFET. Following these tests, the car was driven 483 km on the AMA schedule and the test series repeated. The test results are shown in Table 5.

Recall that the FTP emission level goals for this project are 0.25 g/km HC, 2.11 g/km CO, and 0.93 g/km NO_x. While no goal was set for sulfates, it has been agreed that a practical target level was 3.11 mg/km or less. The car without air modulation met the goal for CO only. When equipped with air modulation, the car met the sulfate target but none of the gaseous emissions goals.

The air modulation system had demonstrated its ability to reduce sulfate emissions. While the gaseous goals were not met, the FTP gaseous emissions were close enough to the goals to indicate that with additional adjustments to the engine and air modulation system, the gaseous emission goals could be met, while keeping the sulfates below the target of 3.11 mg/km.

It was felt that sufficient testing had been done to successfully demonstrate the effectiveness of the air modulation system so that this series of tests concluded the system development phase.

B. High Temperature Exhaust System Development

Theoretical analysis and laboratory tests have shown that the amount of exhaust SO_2 converted to sulfate in an oxidation catalyst system decreases as temperature increases.(20,25) An increase in exhaust temperature at the catalyst from 480° to 540°C (900°F to 1000°F) could theoretically result in a 30 to 40 percent reduction in sulfate emissions.

Raising the catalyst inlet temperature then becomes an attractive technique for control of sulfate emissions, particularly if the temperature increase can be accomploshed by heat conservation techniques alone. As one of the emission control systems to be evaluated for this project, a high temperature exhaust system was to be designed and built. This system was to rely on heat conservation techniques, with a target temperature increase of 80°C (approximately 150°F).

To accomplish this objective three changes were proposed to the exhaust system:

- Install exhaust port liners in the engine heads
- Use insulated exhaust manifolds
- Mount the catalysts as close as possible to the exhaust manifold

Published studies indicated that by far the most effective means of conserving exhaust heat is by the use of exhaust port liners. (19,26) Since heads with exhaust port liners were available for a Chevrolet 5.7 litre (350 CID) engine, the 1975 Nova described in Section II was used as the test car for the high temperature exhaust system evaluation. The insulated exhaust manifold and port liners were to be tested separately and in combination so that the contribution of each component could be evaluated. In addition, the stock pelleted catalysts were to be replaced with monolith catalysts, which had shown a somewhat lower sulfate storage capacity in a previous project.(7)

For the insulated manifolds, a decision was made against merely insulating the stock exhaust manifolds, since it was felt that the stock nodular cast iron manifolds would have a tendency to crack when insulated. It was therefore decided to design and fabricate a set of exhaust manifolds specifically for this project.

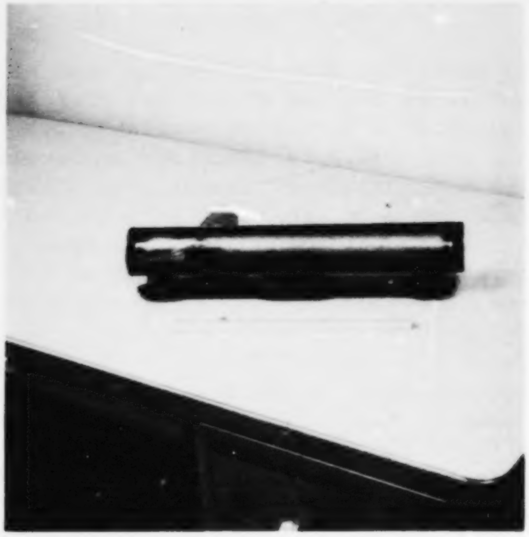
A study of port liners by Ford Motor Company(26) had indicated that air gap insulation gave the lowest heat loss of several techniques evaluated. It was felt that for the exhaust manifold also, air gap insulation would give the lowest heat rejection. The insulated exhaust manifold should also have low thermal inertia to keep the start up exhaust temperature as hot as possible.

Using these criteria, a set of welded stainless steel exhaust manifolds were designed with a 19 cm (0.75 in) air gap. Photographs of the manifolds are shown in Figure 12.

The manifold weldments were fabricated and installed prior to installing the heads with exhaust port liners so that the effects of the insulated manifolds alone could be evaluated. To conserve badly needed time, the insulated manifolds were evaluated with the stock exhaust pipe and pelleted catalyst, since the exhaust system with the two monolith catalysts was still being fabricated.

Table 6 shows the test results of the test series with the stock exhaust manifolds and exhaust system and series with the insulated exhaust manifolds. The temperature data from the test series with the SwRI built insulated exhaust manifolds indicated that these manifolds were only marginally successful in increasing the exhaust gas temperature into the catalyst. The FTP test with insulated manifolds showed only a 7°C(12°F) increase over the stock manifold FTP temperature.

When the temperature traces from the two tests were compared, the insulated manifolds were found to produce hotter exhaust gas temperatures during the cold start 505 second portion of the FTP test. The exhaust temperature difference between the two systems began to decrease after 505 seconds. It continued to decrease until the end of the test, when the exhaust temperature using stock manifolds was actually higher than the exhaust temperature from the insulated manifolds.



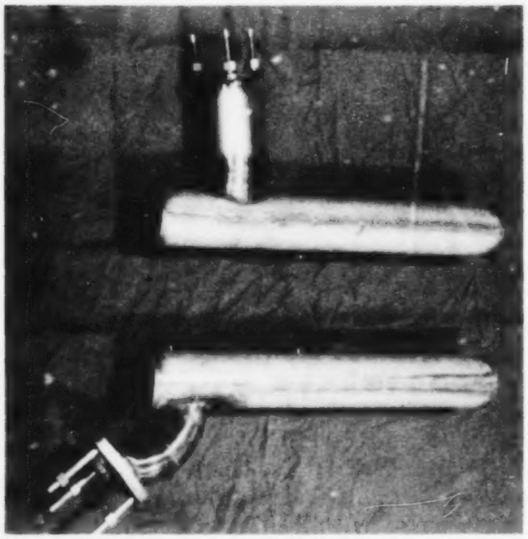


Figure 12. Air gap insulated exhaust manifolds

TABLE 6. RESULTS FROM INSULATED MANIFOLD TESTS WITH PELLETED CATALYST

Date	Test Type	Configuration	Gaseous Emissions g/km (g/mile)			H_2SO_4 mg/km (mg/mile)	Average Exhaust Temp°C(a)	Fuel ℓ/100 km (mpg)
			HC	CO	NO_x			
5/13/77	FTP	Stock	0.22 (0.35)(b)	1.44 (2.32)	0.77 (1.24)	-----------	472 (882)	17.26 (13.63)
5/13/77	CFDS	Stock	0.03 (0.05)	0.23 (0.37)	0.81 (1.30)	7.11 (11.44)	545 (1013)	14.05 (16.74)
6/10/77	FTP	w/ins.exh.(c)	0.34 (0.55)	1.72 (2.77)	0.77 (1.24)	-----------	479 (894)	18.87 (12.46)
6/10/77	CFDS(d)	w/ins.exh.	0.21 (0.34)	3.57 (5.74)	0.45 (0.72)	14.51 (23.35)	517 (962)(b)	17.06 (13.79)

---

a average temperature at exhaust manifold exit
b left cylinder bank only (cylinders 1,3,5,7). See Note d.
c insulated exhaust manifolds installed
d two spark plugs misfiring during this test

The CFDS tests with the SwRI insulated manifolds had a 28°C (50°F) lower average temperature than the CFDS tests with stock manifolds. During the CFDS tests with the insulated manifolds the numbers six and eight spark plugs were observed arcing through the boot to the manifold. Since these cylinders exhaust into the right hand manifold, only the left cylinder bank exhaust temperature was used for the CFDS comparison.

The HC and CO emissions and fuel consumption from the CFDS test with the insulated manifolds are higher, and the NO_x emissions are lower than the CFDS test with the stock exhaust system, as would be expected with the misfiring cylinder.

From the temperature data of these two test series, it appears that insulated manifolds give higher exhaust temperatures during cold engine operation only. During stop and go driving, as represented by the stabilized portion of the FTP, the stock cast exhaust manifolds apparently give up some stored heat during low power and idle operation. This raises the temperature from the stock manifolds above the temperature from the insulated manifolds, which being less massive than the stock manifolds, have a smaller heat storage capacity.

As was pointed out earlier, these tests were run with a stock pelleted catalyst, rather than the monolith catalysts planned for use with the high temperature system. Pelleted catalysts are capable of considerable sulfate storage and subsequent release. Since no attempt was made to duplicate the long term preconditioning, no comparison should be attempted between the sulfate emissions of the two CFDS tests run on May 13 and June 10.

Following these tests, the stock exhaust manifolds were reinstalled and the pelleted catalyst was replaced with two monolith catalysts, one for each cylinder bank. The car was driven for 805 km on the AMA durability driving schedule. It was then tested twice (June 28, and July 1, 1977) using the development test sequence (FTP, CFDS, HFET) with 483 km durability driving between the two test series. This test series was designated as the baseline test. The cylinder heads with exhaust port liners were then installed together with the exhaust manifolds supplied with the heads. (1973 production nodular iron manifolds). The car was again driven for 805 km of durability and the test sequence repeated twice (July 20 and 22, 1977) with 483 km of durability between test sequences. The results of these tests are shown in Table 7.

The average gaseous emissions from the two baseline FTP tests and the average of the two FTP tests with port liners were within the project goals as they were prior to changing the NO_x goal (0.25 g/km HC, 2.11 g/km CO, 0.93 g/km NO_x). However, one of the baseline FTP tests had a NO_x level slightly above the goal level. One FTP test with port liners had both CO and NO_x levels slightly above the goals.

The exhaust temperature for all tests with port liners were higher than the exhaust temperatures from the same test type without exhaust port liners. CFDS tests with the port liners had an average sulfate emission level approimately 37 percent less than the average baseline CFDS sulfate level.

TABLE 7. RESULTS FROM BASELINE AND TESTS WITH PORT LINERS AND MONOLITH CATALYSTS

Date	Test Type	Configuration	Gaseous Emissions, g/km (g/mile) HC	CO	NO_x	H_2SO_4 mg/km (μg/mi)	Avg. Exh. Temp. °C (°F)[a]	Fuel ℓ/100 km (mpg)
6/28/77	FTP	Baseline	0.19(0.31)	1.25(2.01)	0.77(1.24)	3.04(4.89)	456(852)	17.54(13.41)
7/1/77	FTP	Baseline	0.19(0.31)	1.24(2.00)	0.94(1.51)	0.11(0.18)	445(834)	17.24(13.64)
Average			0.19(0.31)	1.24(2.00)	0.86(1.38)	1.58(2.54)	450(843)	17.39(13.53)
6/28/77	CFDS	Baseline	0.05(0.08)	0.20(0.32)	0.73(1.17)	11.52(18.54)	545(1013)	13.95(16.86)
7/1/77	CFDS	Baseline	0.06(0.10)	0.21(0.34)	0.87(1.40)	8.53(13.73)	520(968)	13.44(17.50)
Average			0.06(0.09)	0.20(0.33)	0.80(1.29)	10.03(16.14)	532(990)	13.70(17.18)
6/28/77	FET	Baseline	0.04(0.06)	0.13(0.21)	0.78(1.26)	27.54(44.31)	573(1063)	12.60(18.69)
7/1/77	FET	Baseline	0.03(0.05)	0.12(0.19)	0.91(1.46)	26.18(42.12)	573(1063)	12.82(18.35)
Average			0.03(0.05)	0.12(0.20)	0.84(1.36)	26.86(43.22)	573(1063)	12.71(18.52)
7/20/77	FTP	w/liners[b]	0.15(0.24)	1.85(2.98)	0.78(1.25)	1.11(1.79)	526(979)	17.86(13.17)
7/22/77	FTP	w/liners	0.18(0.29)	2.25(3.62)	0.95(1.53)	0.40(0.64)	519(967)	18.52(12.70)
Average			0.16(0.26)	2.05(3.30)	0.86(1.39)	0.76(1.22)	522(973)	18.19(12.94)
7/20/77	CFDS	w/liners	0.04(0.06)	0.57(0.92)	0.82(1.32)	5.43(8.74)	608(1126)	13.81(17.03)
7/22/77	CFDS	w/liners	0.04(0.06)	0.55(0.88)	0.99(1.59)	7.16(11.52)	606(1123)	13.86(16.97)
Average			0.04(0.06	0.56(0.90)	0.90(1.46)	6.30(10.13)	607(1124)	13.84(17.00)
7/20/77	FET	w/liners	0.02(0.03)	0.10(0.16)	0.88(1.42)	18.66(30.02)	651(1204)	13.04(18.04)
7/22/77	FET	w/liners	0.02(0.03)	0.24(0.39)	1.05(1.69)	18.05(29.04)	657(1214)	13.26(17.74)
Average			0.02(0.03)	0.17(0.28)	0.96(1.56)	18.36(29.53)	654(1209)	13.15(17.89)

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[a] Average temperature at exhaust manifold exit

[b] Exhaust port liners installed

While this is a considerable decrease in sulfate emissions, two facts should be pointed out. The first is that the baseline CFDS sulfate emissions are lower than average for a car with air injection. The EPA sulfate baseline study showed an average of 17.7 mg/km for oxidation catalyst cars with air injection.(5) The second fact is that even with a 37 percent reduction, the CFDS sulfate emissions from tests with the port liners are still somewhat above the target level of 3.1 mg/km.

The percent conversion of fuel sulfur to sulfate for the CFDS and HFET tests listed in Table 7 are shown in Figure 13 as a function of exhaust temperature. Also shown on the figure is a theoretical equilibrium curve for two percent excess oxygen and a curve showing laboratory test results for a catalyst with 50,000 hr^{-1} space velocity. Both of these curves are from Reference 20. From the figure, it can be seen that the actual rate of decrease in sulfate emissions with temperature is considerably less than the theoretical equilibrium rate. From examination of the figure, it appears that an additional exhaust temperature increase of approximately 70°C (126°F) would be required to obtain the target sulfate level. In an attempt to reach the target sulfate levels, the insulated exhaust manifolds were installed on the car and the test procedure repeated. The temperature as the exit of the exhaust manifold (left side) is shown in Table 8 for the tests with and without the insulated manifolds.

TABLE 8. EXHAUST TEMPERATURE WITH AND WITHOUT INSULATED MANIFOLDS

Test Type	Date	Configuration	Exhaust Manifold Exit Temp. °C
FTP	7/20 & 7/22 (Avg.)	w/o insulated man. w/liners	522 (973°F)
FTP	8/15/77	w/insulated man. w/liners	522 (972°F)
SET	7/20 & 7/22 (Avg.)	w/o insulated man. w/liners	607 (1124°F)
SET	8/15/77	w/insulated man. w/liners	595 (1103°F)

It is evident that the insulated manifolds had little affect on the exhaust temperature. This is not to say that exhaust manifolds could not be built that would give increased exhaust temperature. However, these test results do indicate that successful design of such manifolds requires more time and effort than programmed under this study.

Since there was little difference in temperature with insulated manifolds, the test results with port liners alone were used to evaluate the potential of the high temperature exhaust system. Development testing of the high temperature exhaust system was therefore brought to a close.

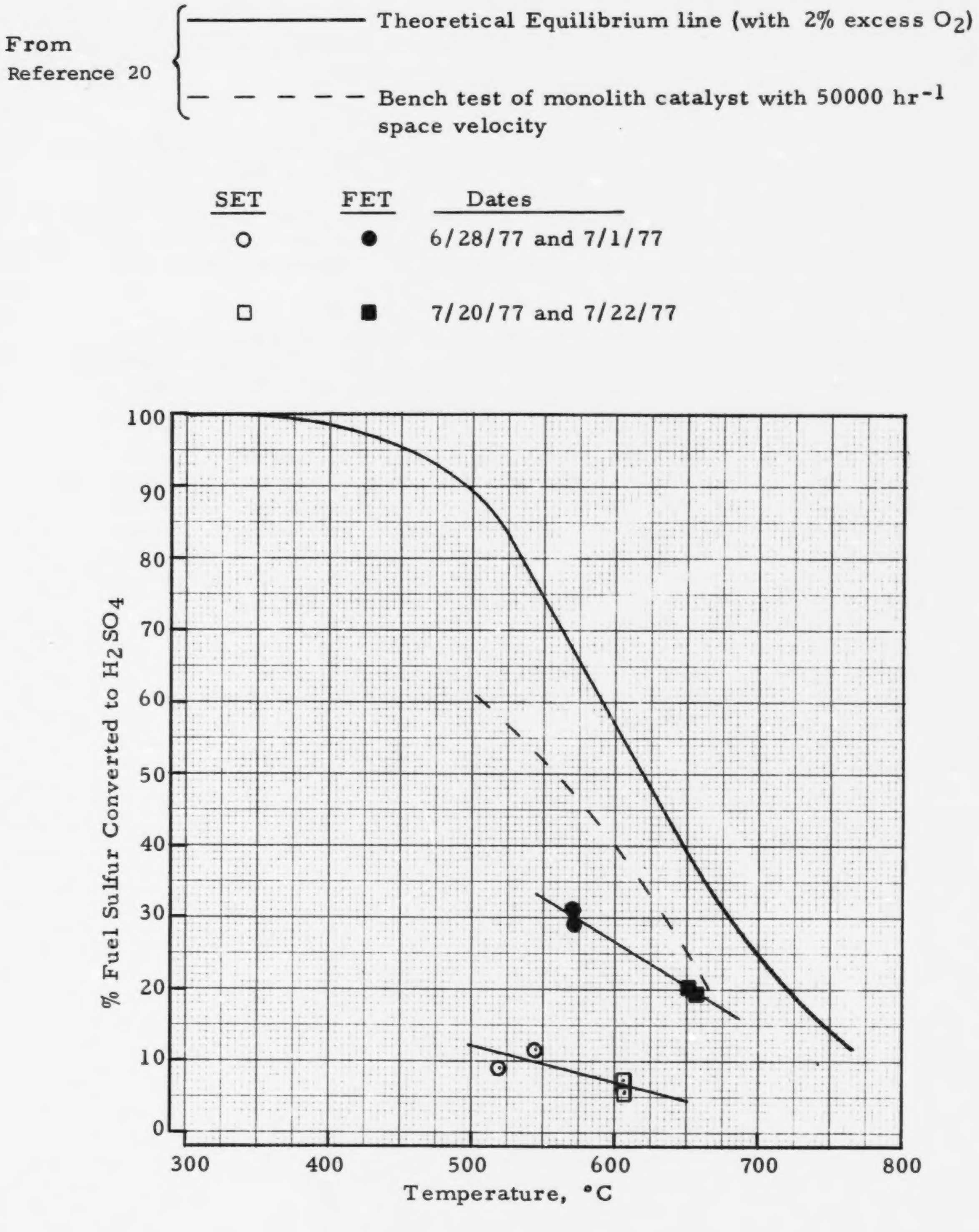


Figure 13. Conversion of fuel sulfur to H_2SO_4 for baseline and high temperature tests of 1975 Nova

C. Emission Control System Rating

Only one of the two systems evaluated was to be tested for durability. Therefore, some method of rating each system was needed so that the best system was chosen for durability testing. The systems were rank ordered, based on an assigned numerical value for each system. This numerical value was obtained by assigning a number between one and ten for each of several evaluation parameters, then summing the individual numbers to obtain a single number of each system.

The parameters considered were gaseous emissions, sulfate emissions, fuel economy, estimated durability, and estimated cost. Gaseous emissions were based on the 1975 FTP (LA-4 cycle), sulfate emissions on the CFDS cycle, and fuel economy on the city and the highway cycle.

Each of the parameters considered had a different scoring criteria. Basically, the higher the score, the more desirable (lower cost, better durability, lower emissions, etc.) the control system. Individual parameter scores were multiplied by a weighting factor, indicating the relative importance of each parameter. The weighting factors were subjective, but did serve to give more emphasis to the more important evaluation items. The scoring criteria for each individual item is shown in Table 9.

The evaluation scores of the two systems are shown in Table 10. An explanation of each score is contained in Appendix A. Since the air modulation system scored highest in the evaluation, it was chosen for further optimization and durability testing.

TABLE 9. EVALUATION SCORING CRITERIA

Evaluation Item		Scoring Criteria	Score	Weighting Factor
1. Gaseous Emissions	(a)	HC, CO, NO_x below 0.25, 2.11 and 0.93 g/km respectively	10	2.0
	(b)	Only one of the gaseous emissions is over the goal and it does not exceed the goal by more than 50%	5	
	(c)	More than one of the gaseous emissions is over the goal	0	
2. Sulfate Emissions	(a)	3.1 mg/km or less on CFDS test	10	1.5
	(b)	Greater than 6.2 mg/km	0	
	(c)	Between 3.1 and 6.2 mg/km	(3.226-SO_4 mg/km)	
3. Fuel Economy	(a)	Fuel economy improved by more	10	1.0
	(b)	Fuel economy ±5%	5	
	(c)	Fuel economy decreased by more than 5%	0	
4. Durability	(a)	Estimate life of system without repairs or replacement (only addition parts added for sulfate control - not total system).	$\left(\frac{\text{miles}}{50{,}000 \times 10}\right)$	1.0
5. Cost	(a)	Least cost system	10	1.0
	(b)	For other systems	$\left(\frac{\text{least cost}}{\text{system cost}}\right) \times 10$	

TABLE 10. EMISSION CONTROL SYSTEM EVALUATION RATINGS

Evaluation Item	Score	Weighting Factor	Weighted Score	Max. Possible Weighted Score
		Air Modulation System		
1. Meets gaseous emission goals	5	2.0	10	(20)
2. Sulfate emissions	10	1.5	15	(15)
3. Fuel economy	5	1.5	7.5	(15)
4. Durability	5	1.0	5	(10)
5. Cost	10	1.0	10	(10)
TOTAL SCORE		---	47.5	(70)
		High Temperature Exhaust System		
1. Meets gaseous emission goals	10	2.0	20	(20)
2. Sulfate emissions	0	1.5	0	(15)
3. Fuel economy	5	1.5	7.5	(15)
4. Durability	10	1.0	10	(10)
5. Cost	3.3	1.0	3.3	(10)
TOTAL SCORE		---	40.8	(70)

III-3. AIR MODULATION SYSTEM-OPTIMIZATION AND DURABILITY TESTING

The air modulation concept was proven on the 1976 Chevrolet Impala and chosen as one of the systems to be optimized and tested for durability. The complete air modulation system was therefore installed on the durability test car, the 1975 Nova described in Section II, and optimization of the system begun.

A. Air Modulation System Optimization

Since the basic car was not designed to meet 1981 standards, considerable work was required to bring the gaseous emissions within the project goals. The steps to reaching the project goals were:

1. Installed heads with exhaust port liners
2. Reinstalled stock head without port liners
3. Installed new rear axle (changed from 3.08 to 2.56 ratio)
4. Changed timing from 6° to 8° BTC and increased EGR
5. Installed new carburetor, increased EGR
6. Installed new intake manifold and increased EGR valve orifice to 12.8 mm

When the air modulation system was installed on the Nova, considerable testing was required to adjust the air modulation valve. The intake manifold vacuum range for the Nova was smaller than the vacuum range of the 1976 Impala on which the system was developed, necessitating a change in the size of the valve vacuum chamber and spring.

Since the high temperature exhaust system had just completed evaluation on the 1975 Nova, the cylinder heads with exhaust port liners were still installed. These heads were left in place to determine if the port liners would help reduce the CO emissions. Eleven tests were performed using the cylinder heads with exhaust port liners. The results from the test with the lowest overall emissions (9/30/77) are listed in Table 11. As can be seen, the car did not meet the CO or NO_x emission goals in that configuration.

On examination of test data with the stock emission control system, it was found that the stock cylinder heads, without port liners had lower CO emissions than the heads with liners. The reason for this difference was not evident, but was assumed to be a function of some difference in head geometry. It was therefore decided to reinstall the stock cylinder heads and continue the optimization testing.

TABLE 11. FTP TEST RESULTS FOR AIR MODULATION SYSTEM INSTALLED ON 1975 NOVA

Date	Configuration	Gaseous Emissions g/km (g/mile)			Fuel
		HC	CO	NO_x	ℓ/100 km (mpg)
9/30/77	w/liners & air mod.	0.19(0.31)	2.75(4.42)	0.76(1.22)	16.95(13.88)
11/3/77	std. head w/o air mod.	0.21(0.34)	1.86(2.99)	0.85(1.37)	16.95(13.89)
11/4/77	std. heads & air mod.	0.23(0.37)	2.54(4.09)	0.79(1.27)	17.86(13.17)
11/29/77	std. head, 2.56 axle w/air mod.	0.20(0.32)	1.42(2.28)	0.89(1.43)	16.13(14.58)
11/30/77	std. head, 2.56 axle w/air mod.	0.22(0.35)	3.38(5.44)	0.81(1.30)	16.67(14.11)
12/12/77	increased EGR, 8°BTC	0.18(0.29)	2.84(4.57)	0.64(1.03)	17.24(13.64)
12/30/77	new intake manifold, new carb., inc. EGR, 8° BTC	0.28(0.45)	1.86(2.99)	0.62(1.00)	17.09(13.76)
1/16/78	new intake manifold, 12.8 mm EGR, 9°BTC	0.19(0.31)	0.93(1.49)	0.55(0.89)	17.22(13.66)
1/18/78	new intake manifold, 12.8 mm EGR, 9°BTC	0.19(0.31)	0.92(1.49)	0.59(0.91)	17.19(13.68)
1/31/78	new intake manifold, 12.8 mm EGR, 9°BTC	0.19(0.31)	1.03(1.65)	0.48(0.77)	17.54(13.41)

Seven cold start FTP tests were run in this configuration. The test on 11/4/77 produced the best overall emissions. However, CO and NO_x were still above the project goals as shown in Table 11.

The third step of the optimization procedure was to change the rear axle ratio in an effort to lower CO emissions and improve fuel economy. A test without the air modulation system showed a reduction in CO and an improvement of approximately five percent in fuel economy. When a test was run on 11/30/77 with the air modulation system installed, the CO increased to a level above the best test with the original axle ratio. While not realized at the time, this was the result of an intermittent carburetor problem which would continue to hinder the optimization effort.

Since the 11/30/77 test demonstrated CO and NO_x emissions above the project goals, it was decided that additional changes were required. The EGR valve flow area was enlarged to increase the amount of EGR. The carburetor accelerator pump stroke was shortened and the ignition timing advanced to 8° BTC. This configuration constituted the forth step in the optimization procedure.

Six tests were run in this configuration, with the idle CO set at various A/F ratios. The best overall emissions were obtained from the 12/12/77 test. The CO and NO_x emissions were still above the project goals as shown in Table 11. However, there was a decrease in NO_x compared to previous tests.

After examining the CO traces from tests during Steps 3 and 4, it was evident that there was an intermittent problem with the carburetor, confusing the interpretation of the test results. The carburetor on the car had undergone extensive modification during a previous EPA project. It was felt that returning to a stock carburetor would improve the test-to-test repeatability.

A new Rochester "Quadajet" four barrel carburetor, part number 17054703, was installed. The amount of EGR was also increased. This configuration was the fifth step of optimization. Three tests were run in this configuration. The best emissions were obtained from the 12/30/77 test, listed in Table 11. For the first time, both CO and NO_x met the project goals, however HC was slightly above the project goal.

The last step in the optimization process was to install an aluminum Edelbrock "Streetmaster II" single plane intake manifold in an effort to decrease the time for the intake manifold to reach operating temperature. The timing was also advanced to 9° BTC. The EGR valve metering rod diameter was reduced to increase EGR. To further increase EGR, a new EGR valve orifice, 12.5 mm in diameter, was installed to place of the 10 mm orifice that had been used. An FTP test with this configuration was run on 1/16/78, with a replicate test run on 1/18/78. These tests met all gaseous emission goals with a sufficient margin for deterioration during durability testing.

The car was driven for 320 km (200 miles) on the AMA durability route to season the catalyst at the new exhaust oxygen level. A complete series of tests (FTP, CFDS, FET) was then run on 1/31/78 to determine the sulfate emissions. The CFDS sulfuric acid emissions were 3.85 mg/km (6.19 mg/mile). This was a 62% reduction from the Nova baseline obtained during the high temperature exhaust study (see Table 7). While the sulfate emissions were slightly above the 3.1 mg/km project goal, it was decided that they were low enough to proceed with the durability testing.

B. Air Modulation System Durability Testing

Following optimization of the air modulation system, the car was readied for durability testing. During a previous EPA project, the car had been driven 14160 km (8800 miles). By the end of optimization testing of the air modulation system, the 1975 Nova had accumulated a total of 19630 km (12200 miles). This represents a significant amount of use for the basic engine systems; therefore a minor overhaul was performed to bring the engine as close to a "zero miles" condition as possible. The overhaul consisted of the following maintenance items.

- Remove heads and remove deposits from top of piston
- Remove deposits from head, soak head in solvent, lap valves in seats and reinstall heads
- Clean inside of exhaust manifolds and reinstall
- Replace spark plugs and ignition wires
- Replace catalysts
- Replace manifold air injection tubes
- Change oil and oil filter
- Set timing 10° BTC and idle speed to 600 rpm

Following this minor overhaul, the car was driven for 322 km (200 miles) on the AMA durability schedule. Two replicate test series constituting the "zero kilometer" test were then performed.

Nova Distance Accumulation Chronology

With the zero kilometer tests on 2/28/78, the durability testing on the 1975 Nova with the air modulation system was begun. A replicate emissions, zero kilometer, test was run on 3/2/78. Distance accumulation began on March 9, 1978. The car was driven on the distance accumulation course shown in Figure 4, Section II, for two 8-hour shifts per day, 5 day per week. Approximately 640 km (400 miles) were accumulated each day. Duplicate emission tests were performed every 8050 km, with 805 km (500 miles) of the durability driving schedule accumulated between the first and second test series to provide equivalent catalyst sulfate conditioning.

Scheduled maintanance was performed every 12,070 km (7500 miles) as specified in the 1975 Chevrolet Service Manual. A summary of the required maintenance is shown in Table 12.

Durability distance accumulation continued until 28435 km (17673 miles), at which time the durability testing was stopped because all FTP gaseous emissions were at or above the project goals, with no possibility of decreasing as distance accumulation continued. A graphical representation of the distance accumulation records is presented in Figure 14. The figure shows daily distance, maintenance and emissions test points.

Nova Fuel and Oil Consumption

The average fuel and oil consumption for the interval between each emission test is shown in Table 13. The fuel consumption is quite consistent between emissions test and at the level expected from FTP and HFET tests during the optimization. Since there were only 5 quarts (4.7 litres) of oil added between oil changes during the 28435 km of durability testing, the oil consumption in each interval appears somewhat erratic, depending on when the oil was added.

TABLE 13. FUEL AND OIL CONSUMPTION DURING
DURABILITY TESTING FOR 1975 NOVA

Distance Interval, km (mile)	Fuel ℓ/100 km (mpg)	Oil Consumption ℓ/1000 km (qt/1000 mi)
0-8050 (0-10000)	15.50(15.18)	0.261(0.444)
8050-16100 (5000-10000)	15.61(15.07)	no oil added
16100-24150 (10000-15000)	15.17(15.51)	0.513(0.873)
0-24150 (0-15000)	15.48(15.20)	0.166(0.283)

However, the overall oil consumption of 0.17 ℓ/1000 km (0.28 qts/1000 miles) is considered somewhat better than average.

Nova Emission Rest Results

The average results from the four duplicate emission test series run on the Nova during durability testing are listed in Table 14. These test results are shown graphically as a function of distance accumulated in Figures 15 and 16. As can be seen from the table and figures, all emissions were at or within the project goals at the zero and 8050 km test points. However, starting with the 16100 km test series, at least two, and on occasion all, of the FTP gaseous emissions were above project goals.

TABLE 12. MAINTENANCE SCHEDULE FOR 1975 NOVA

COMPLETE VEHICLE MAINTENANCE SCHEDULE

When To Perform Services (Months or Miles, Whichever Occurs First)	Item No.	**Services** (For Details, See Numbered Paragraphs)
Every 6 Months or 7,500 Miles	1	*Chassis Lubrication
	2	●*Fluid Levels Check
	3	*Engine Oil Change
At 1st Oil Chg. - Then Every 2nd	4	*Oil Filter Change
See Explanation	5	Tire Rotation (Steel Belted Radial)
	6	Rear Axle Lube Change
Every 12 Months	7	Air Conditioning Check
Every 12 Months or 15,000 Miles	8	*Cooling System Check
		— Coolant Change & Hose Replacement
Every 30,000 Miles	9	Wheel Bearing Repack
	10	*Auto. Trans. Fluid & Filter Change
	11	Manual Steering Gear Check
	12	Clutch Cross Shaft Lubrication
Every 6 Months or 7,500 Miles	13	Owner Safety Checks
	14	Tire and Wheel Inspection
	15	*Exhaust System Check
	16	*Drive Belt Check
		*— Belt Replacement
	17	Suspension and Steering Check
	18	Brake and Power Steering Check
Every 12 Months or 15,000 Miles	19	Drum Brake and Parking Brake Check
	20	Throttle Linkage Check
	21	Underbody Flush & Check
	22	Bumper Check
At First 6 Months or 7,500 Miles - Then at 18 Month/ 22,500 Mile Intervals	23	Thermo. Controlled Air Cleaner Check
	24	Carburetor Choke Check
	25	Engine Idle Speed Adjustment
	26	EFE Valve Check
	27	Carburetor Mounting Torque
Every 12 Months or 15,000 Miles	28	Fuel Filter Replacement
	29	Vacuum Advance System & Hoses Check
	30	PCV System Check
		— PCV Valve & Filter Replacement
Every 18 Months or 22,500 Miles	31	Idle Stop Solenoid Check
	32	Spark Plug Wires Check
Every 22,500 Miles	33	Spark Plug Replacement
	34	Engine Timing Adjustment & Dist. Check
Every 24 Months or 30,000 Miles	35	ECS System Check & Filter Replacement
	36	Fuel Cap, Tank and Lines Check
Every 30,000 Miles	37	Air Cleaner Element Replacement

● Also A Safety Service

* Also An Emission Control Service

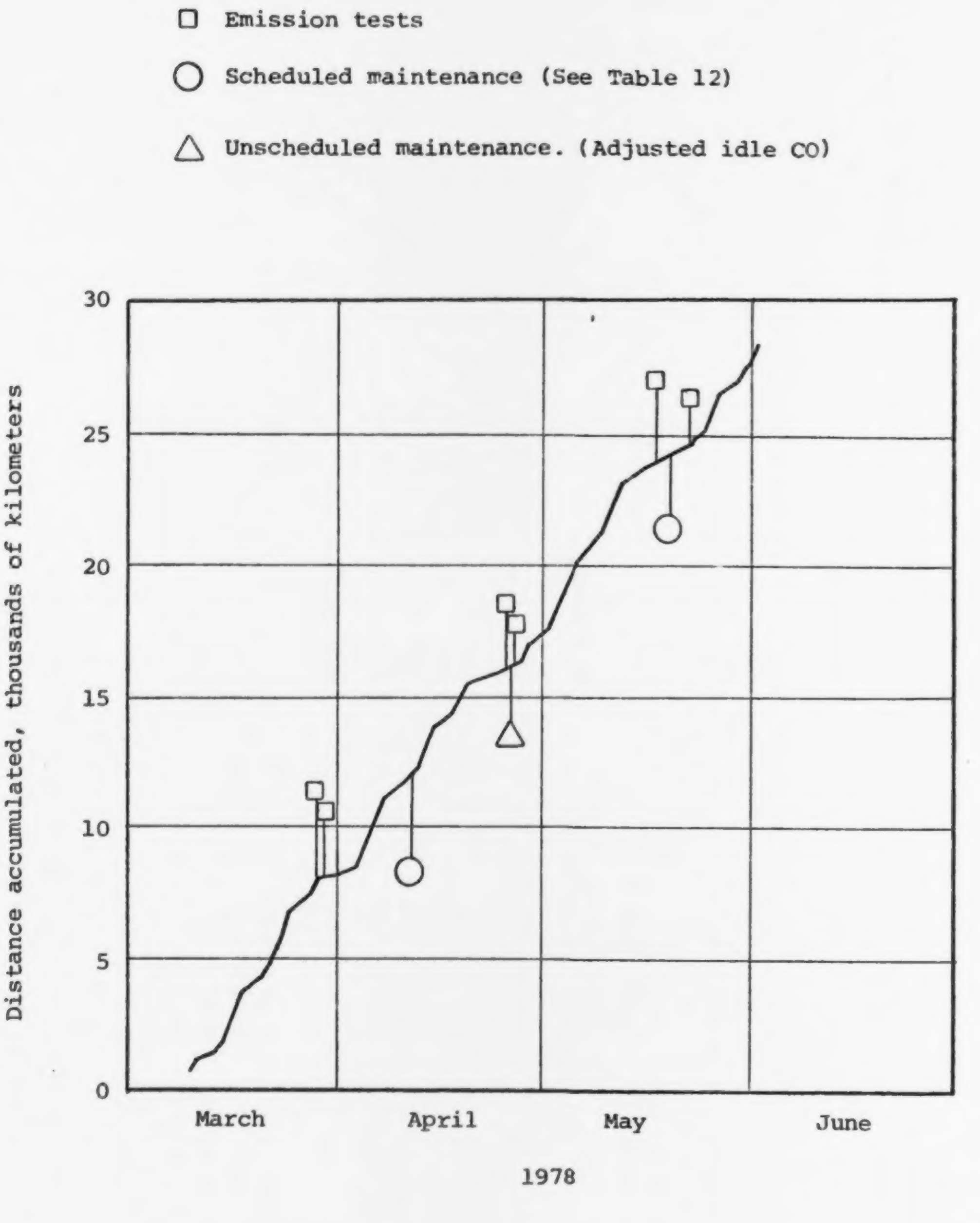


Figure 14. Distance accumulation record of 1975 Chevrolet Nova.

TABLE 14. DURABILITY TEST RESULTS FROM 1975 NOVA WITH AIR MODULATION SYSTEM

Distance Accumulation km (miles)	Gaseous Emissions g/km (g/mile) HC	CO	NO_x	H_2SO_4 mg/km (mg/mile)	Fuel ℓ/100 km (mpg)
		FTP Tests			
300(480)	0.20(0.32)	1.47(2.36)	0.46(0.73)		19.58(12.02)
8050(5000)	0.26(0.41)	2.09(3.36)	0.48(0.78)		18.04(13.04)
16,100(10,000)	0.36(0.58)	4.75(7.64)	0.60(0.97)		17.83(13.20)
16,100(10,000)[a]	0.30(0.48)	0.74(1.18)	0.63(1.01)		17.22(13.66)
24,150(15,000)	0.35(0.56)	2.56(4.12)	0.65(1.04)		17.24(13.65)
24,150(15,000)[b]	0.30(0.48)	2.52(4.06)	0.50(0.80)		17.03(13.82)
		CFDS Tests			
300(480)	0.07(0.11)	1.78(2.88)	0.48(0.76)	2.46(3.97)	14.92(15.78)
8050(5000)	0.08(0.14)	0.44(0.70)	0.58(0.94)	0.40(0.65)	13.58(17.35)
16,100(10,000)	0.11(0.18)	1.15(1.86)	0.67(1.08)	0.47(0.76)	12.89(18.24)
16,100(10,000)[a]	0.12(0.20)	0.05(0.08)	0.73(1.17)	10.47(16.85)	13.27(17.73)
24,150(15,000)	0.13(0.21)	0.27(0.43)	0.71(1.14)	0.62(1.00)	12.97(18.13)
24,150(15,000)[b]	0.12(0.19)	1.16(1.87)	0.50(0.81)	0.75(1.21)	13.64(17.25)
		HFET Tests			
300(480)	0.05(0.08)	0.62(1.00)	0.50(0.80)		13.74(17.13)
8050(5000)	0.06(0.10)	0.38(0.60)	0.70(1.12)		12.38(19.00)
16,100(10,000)	0.08(0.13)	0.11(0.18)	0.67(1.07)		11.36(20.70)
16,100(10,000)	0.10(0.17)	0.04(0.06)	0.65(1.04)		11.42(20.61)
24,150(15,000)	0.10(0.15)	1.13(0.21)	0.74(1.19)		11.77(19.99)
24,150(15,000)	0.10(0.16)	0.43(0.69)	0.50(0.80)		12.00(19.60)

[a] After adjusting idle CO level to 0.30 percent.
[b] After 24150 km (15,000 miles) scheduled maintenance

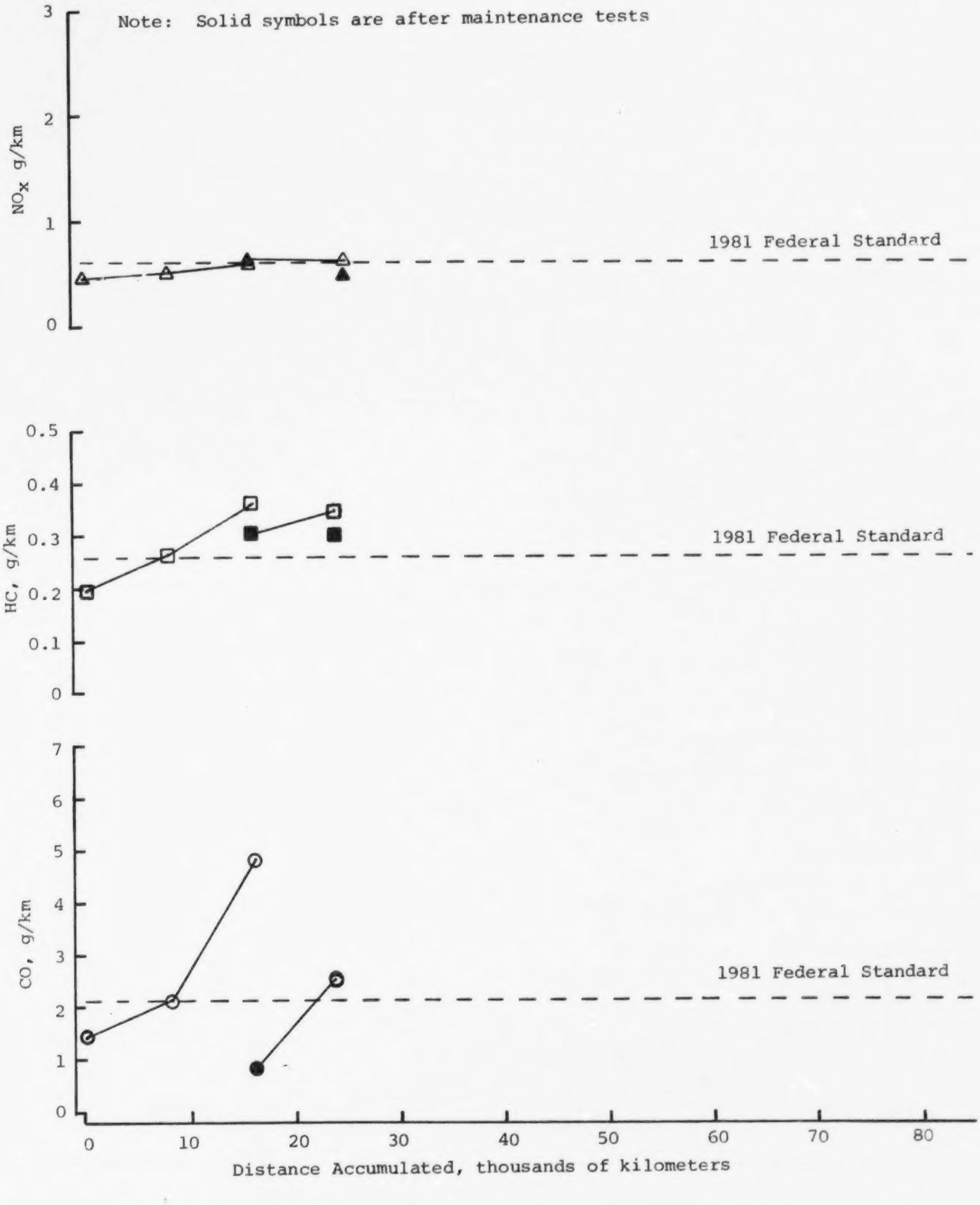


Figure 15. Emissions as a function of distance accumulated for a 1975 Nova with air modulation

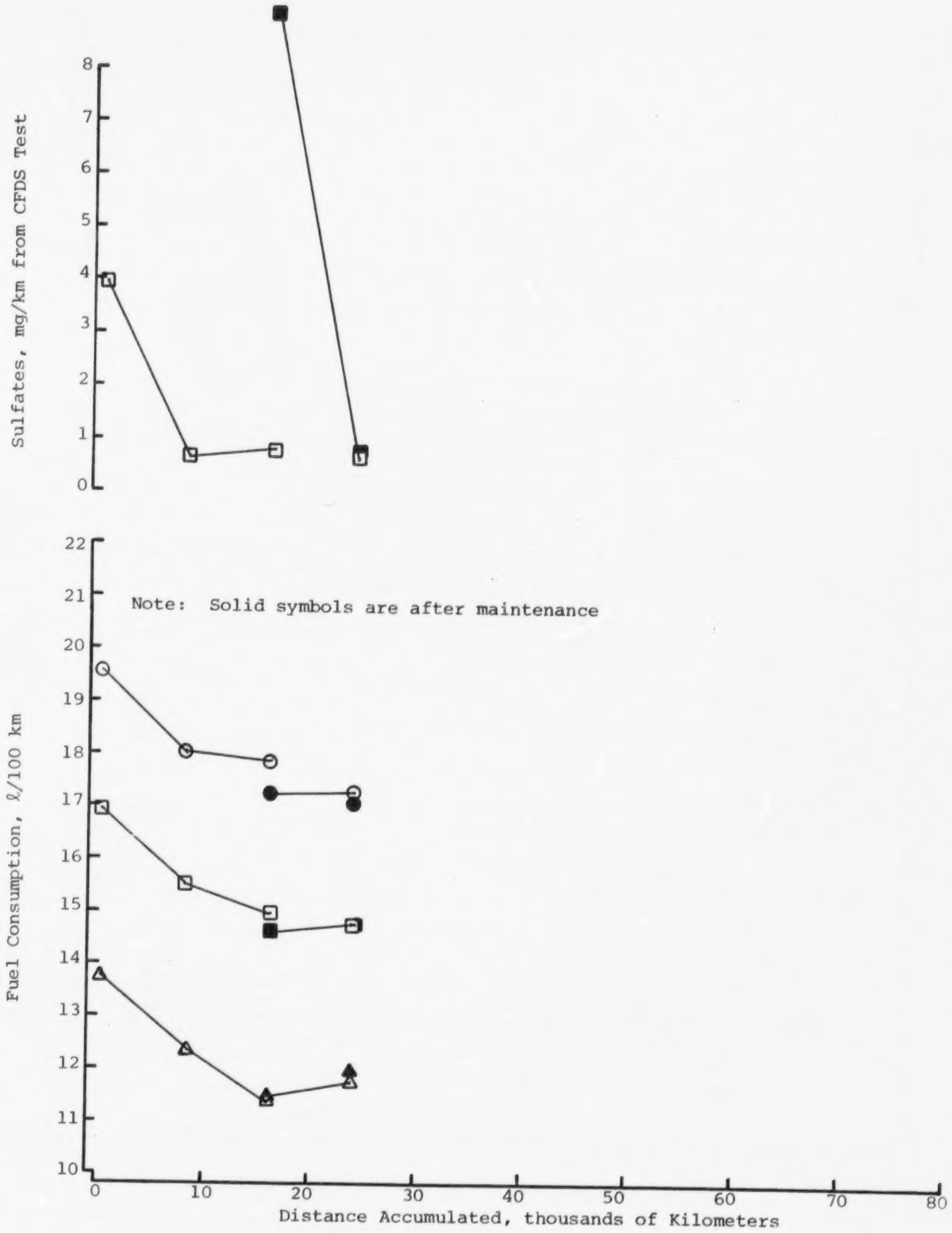


Figure 16. Fuel consumption and sulfates as a function of distance for a 1975 Nova with air modulation system

After the first 16100 km test, the high CO level seemed to indicate a carburetor problem. Following the test series, the engine out emissions were meausred at several speeds, including idle. The measured idle CO level of 1.53 percent was considerably higher than the 0.30 percent idle CO set at the start of durability testing. The reason for this change could not be ascertained. The idle mixture screws were adjusted to give an engine out CO of 0.30 percent at idle in drive.

A test sequence with the correct idle CO was run on April 26, 1978. From the results, shown in Table 14 as "after maintenance", it can be seen that the FTP CO and HC levels were considerably lower than the first test series. The CO and NO_x FTP emissions met the project goals. However, the HC emissions from the FTP were slightly higher than the 0.25 g/km project goal. The sulfate emissions on the CFDS tests increased from 0.47 mg/km on April 25, 1978, to 10.47 mg/km on April 26, 1978. This magnitude of increase could have been caused by the air modulation valve sticking at times, allowing more than the scheduled air injection to the catalyst. The centrifugal clutch was also observed engaging sporadically during idle modes. This too may have contributed to the higher than usual sulfate emissions by providing some air injection at idle. The additional air injection could have also helped to lower the CO emission levels. Maintenance on the centrifugal clutch and air modulation valve was not scheduled until 24100 km.

At the first 24100 km test series, all FTP gaseous emissions were above the project goals. Since 24100 km (15000 miles) was a major scheduled maintenance point, the scheduled maintenance was performed prior to the second test series. There was a small decrease in all three emissions after maintenance, but HC and CO still remained above the project goals.

Unregulated Emissions

From the outset of the project, it was planned to measure methane (CH_4), ammonia (NH_3) and cyanide (HCN) as soon as all the analytical procedures were developed under another EPA project.(17) For the Nova, these emissions were measured at the 16100 and 24150 km test points. Tables 15 and 16 present the results of these measurements. The results are presented without comment since there are no emission standards to which the levels can be compared, and the toxicity of the various compounds was not researched for this project. However, a brief discussion of the relative importance of a number of unregulated emissions is contained in Reference 27.

TABLE 15. UNREGULATED EMISSIONS FROM 1975 NOVA WITH AIR MODULATION SYSTEM - 16100 km TEST

Date	Test Type	Ammonia mg/km	Total(a) cyanide mg/km	Methane g/km	Non-methane HC g/km
4/25/78	FTP	3.65(b)	0.15(b)	0.14	0.22
4/26/78	FTP(c)	0.03(b)	0.06(b)	0.10	0.20
4/25/78	CFDS	3.33	0.02	0.04	0.07
4/26/78	CFDS(c)	2.16	N.D.(d)	0.04	0.08
4/25/78	HFET	2.45	0.17	0.03	0.05
4/26/78	HFET(c)	0.53	0.12	0.03	0.07

(a) Total cyanide is cyanide (HCN) plus cyanogen (C_2N_2)
(b) Single unweighted sample for all of FTP
(c) Tests on 4/26/78 were after adjusting idle CO level to 0.30 percent
(d) N.D. - none detected

TABLE 16. UNREGULATED EMISSIONS FROM 1975 NOVA WITH AIR MODULATION SYSTEM - 24100 km TEST

Date	Test Type	Ammonia mg/km	Total(a) cyanide mg/km	Methane g/km	Non-methane HC g/km
5/17/78	FTP	6.56(b)	0.11(b)	0.14	0.21
5/22/78	FTP(c)	1.54(b)	0.12(b)	0.15	0.15
5/17/78	CFDS	2.47	0.07	0.04	0.09
5/22/78	CFDS(c)	2.39	0.01	0.05	0.07
5/17/78	HFET	5.23	0.11	0.03	0.07
5/22/78	HFET(c)	2.52	0.23	0.04	0.06

(a) Total cyanide is cyanide (HCN) plus cyanogen (C_2N_2)
(b) Single unweighted sample for all of FTP test
(c) Tests on 5/22/78 were after maintenance

III-4. THREEWAY CATALYST SYSTEM-OPTIMIZATION AND DURABILITY TESTING

Threeway catalyst systems have been shown to have low exhaust sulfate emissions.(5,28) Therefore, it was decided at the beginning of the project that a threeway catalyst system should be one of the emission control systems optimized and tested for durability. For effective operation, threeway catalysts require a restricted A/F ratio range. Therefore, a feedback fuel control system is required with the threeway catalyst.

Chrysler Corporation agreed to loan EPA a 1977 Fury with a 5.9 litre (360 CID) engine with an experimental Holley feedback carburetor. It was also equipped with an air pump and EGR valve, both disconnected from their respective systems, but installed for possible use during optimization. The car is described in Table 2, Section II. The Holley feedback carburetor is also described in detail in Section II. As received from Chrysler, the car had dummy catalysts installed on each cylinder bank exhaust pipe. Two threeway catalysts, with 5:1 platinum to rhodium ratio and a volume of 1475cc (90 in^3) each, were supplied by Engelhard Industries.

A. Threeway Catalyst System Optimization

A complete test series, consisting of an FTP, CFDS and HFET cycle was performed on the car in the as-received condition. While the car was equipped with an air pump and EGR valve, neither was operational during this test. The test results from this test on March 30, 1977, are shown in Table 17. Since the car had no catalyst installed, the FTP gaseous emissions were quite high. The CFDS sulfate emissions were typical of a noncatalyst car. The fuel consumption on both the FTP and HFET tests indicated that the A/F ratio was richer than desired.

After receipt of the catalysts from Engelhard Industries, a catalyst was installed in the exhaust system of each cylinder bank, as close as possible to the exhaust manifold. After installing the catalysts, the main fuel control circuit trim potentiometer and carburetor idle mixture screws were adjusted to give engine out CO values of 0.80 percent at 80 kph (40 mph) and during warmed up idle, as recommended by Holley.

The usual FTP, CFDS and HFET test sequence was run on 8/17/79, with engine out CO monitored in addition to the usual bagged emissions. Sulfate emissions were taken during the CFDS test. The emissions from each test are shown in Table 17. The FTP gaseous HC and NO_x emissions were at or below the project goals. The CO emission level was over twice the goal level of 2.1 g/km (3.4 g/mile). The CFDS sulfate emission level of 0.49 mg/km (0.79 mg/mile) was below the sulfate target of 3.1 mg/km (5 mg/mile).

TABLE 17. RESULTS OF OPTIMIZATION TESTS OF THREEWAY CATALYST SYSTEM ON A 1977 FURY

Date	Gaseous Emissions g/km (g/mile) HC	Gaseous Emissions g/km (g/mile) CO	Gaseous Emissions g/km (g/mile) NO_x	H_2SO_4 mg/km (mg/mi.)	Fuel ℓ/100 km (mpg)
		FTP Tests			
3/30/77	2.00(3.23)	19.04(30.63)	5.47(8.80)		22.81(10.31)
8/17/77	0.26(0.42)	4.45(7.16)	0.53(0.85)		17.00(13.83)
9/23/77	0.20(0.32)	3.25(5.23)	0.31(0.50)		17.54(13.41)
9/28/77	0.16(0.26)	2.36(3.79)	1.39(2.23)		17.24(13.64)
10/20/77	0.20(0.32)	3.53(5.68)	0.33(0.54)		17.72(13.27)
11/28/77	0.16(0.26)	2.61(4.20)	0.58(0.93)		17.24(13.64)
12/13/77	0.20(0.32)	2.18(3.51)	0.45(0.72)		17.81(13.21)
12/16/77	0.08(0.13)	1.39(2.24)	0.54(0.87)		18.87(12.50)
12/19/77	0.09(0.14)	1.98(3.19)	0.43(0.69)		17.50(13.44)
		CFDS Tests			
3/30/77	1.04(1.67)	10.15(16.33)	4.29(6.90)	1.08(1.74)	
8/17/77	0.14(0.23)	3.26(5.24)	0.12(0.19)	0.49(0.79)	
		HFET Tests			
3/30/77	0.88(1.42)	8.19(13.18)	4.06(6.53)		12.93(18.19)
8/17/77	0.14(0.23)	3.13(5.04)	0.11(0.18)		11.91(19.75)

An examination of the FTP data showed that almost all of the CO was produced during the cold start transient phase of the FTP.

The rest of the optimization testing on this system was performed to reduce the CO during the cold start transient phase of the FTP, while maintaining the HC and NO_x levels within the project goals. Thirty-eight cold start FTP tests were run, with various adjustments and additions to the emission control system, before all FTP gaseous emissions were within the project goals.

The adjustments made can be divided into 5 steps:

1. Manual switching of the cold start circuit to reduce time on cold start open loop, and changing carburetor main jets to a leaner A/F ratio.
2. In addition to (1), manually controlling cold start inlet air heater and manifold heat control valve.
3. In addition to (1) and (2), a separate cold start, open loop fuel control signal generator was installed.
4. In addition to (1), (2), and (3), the EGR valve was activated.
5. In addition to (1), (2), (3), and (4), the standard Plymouth OSAC (orifice spark advance control) system was installed.

To illustrate the effect of each step of the optimization testing, results from seven of 38 tests performed are shown in Table 17.

The first step in the optimization procedure was to shorten the time the fuel control was in open loop mdoe during a cold start. This was done by providing a manually operated switch on the fuel control open loop circuit. The carburetor main jets were also changed to provide a leaner A/F ratio operating range. Ten cold start FTP tests were run during this step with various settings of the electronic control unit closed and open loop trim pots. The CO emission level had been reduced considerably but was still above the project goal. Any attempt to reduce the CO further by leaning the A/F ratio raised the NO_x emissions above the goal level, as seen from the results of the 9/28/77 test, listed in Table 17.

Testing during this time was plagued by intermittent malfunctions of the electronic control unit (ECU) in the fuel system. After the problem was identified, another ECU was obtained from Holley Carburetor and the next step in the optimization testing begun.

Examination of engine out CO traces had shown that the majority of the CO was produced during the first 210 seconds of the cold start. Since there was considerably less CO produced during the same time period of the FTP hot start, CO production during the cold start was obviously a function of engine warmup. There were four systems installed on the car that were used during engine warmup. The systems were: (1) the feedback carburetor cold start system, (2) carburetor choke, (3) manifold heat control system, and (4) the inlet air heating system.

The first two of these system were checked and/or modified during the first step in the optimization testing. During the second step of optimization, operation of the last two systems was investigated. Both systems were modified to allow manual operation, and the flow area for the inlet air heating system was increased. Nine tests were run while investigating the effects of these two systems. The best overall emissions were obtained from the test on 10/20/77. The results of the test, listed in Table 17, showed almost no change from the best Step 1 results.

The fuel control for the feedback carburetor has two modes of operation, as explained earlier. The open loop or cold start mode was understood to be independent of the closed loop mode, so that A/F ratio in one mode could be adjusted without affecting A/F ratio in the other mode. However, during ECU adjustments prior to each of the tests in Steps 1 and 2, it appeared that the open loop and closed loop circuits were not independent of each other.

To test these observations, a test at idle conditions was run on both open loop and closed loop modes. During this test, the control vacuum to carburetor was recorded on a strip chart recorder using a vacuum transducer in the control line. The oxygen sensor millivolt output (an indication of A/F ratio) was also recorded on a strip chart. The control was run in the closed loop mode, then switched to open loop mode. The open loop A/F ratio only was adjusted. However, when the control was switched back to closed loop mode, a corresponding change in the closed loop A/F ratio was observed. After running these tests, it became obvious that a completely independent open loop circuit was required.

A pulse generator circuit was designed and built using a Signetics 555 timer. Tests with the circuit installed constituted the third step in the optimization procedure. While the independent open loop circuit resulted in significantly lower CO emissions, the CO level was still not within the project goal. The best overall emissions obtained from five tests comprising Step 3 were from the 11/28/77 test, as shown in Table 17. Examination of the emission results and A/F ratios indicated that this was the lowest CO level that could be obtained without exceeding the NO_x goal.

It was decided that the EGR system which was installed, but not used, should be activated to allow a leaner A/F ratio for lower CO emission, while maintaining NO_x levels. The activation of the EGR was Step 4 of optimization. While this improved the CO emissions, after seven cold start FTP tests with various ECU settings, it was concluded that it was still not possible to simultaneously meet the CO and NO_x goals. The best overall emission results with the EGR system were on 12/13/77 as listed in Table 17.

At this point, it appeared that it would not be possible to meet the project emission goals with this car. However, there was a stock Plymouth emission control device that had not been used. This device was the standard

Plymouth orifice spark advance control (OSAC) which was used to provide a delay in the distributor vacuum advance signal. The fifth and last step in the optimization process was to test the car with the addition of the OSAC system. Emissions from the initial test with this system met the project goals; however, there was approximately a five percent increase in fuel consumption as demonstrated by the 12/16/77 test results shown in Table 17.

In order to recover some of the fuel economy lost with the OSAC system, a thermally actuated valve was installed in the vacuum lines to bypass the OSAC valve after the engine warmed up (about 2 to 3 minutes). A test with this system was run on 12/19/77. As can be seen from Table 17 there was a definite fuel economy improvement using the OSAC valve only during the cold start, at the expense of a small increase in CO. Since all gaseous FTP emissions were within the project goals and further reduction did not appear possible within the project scope of work, this testing terminated the optimization of the threeway catalyst system. The final emission control system included:

- Feedback controlled carburetor
- Independent open loop fuel control signal for cold starts
- Threeway catalysts
- Shortened cold start operation for choke, inlet air heater and manifold heat
- An EGR system
- An Orifice Spark Advance Control valve

B. Threeway Catalyst System Durability Testing

At the completion of the optimization testing, the Fury had accumulated 9607 km (5971 miles). However, the threeway catalyst system had been operated for less than 3200 km, with most of the system having less than 1200 km of use. It was decided to use the threeway catalyst installation at 8530 km (5300 miles) as the "zero distance" point for durability testing.

To bring the engine systems as close as possible to a zero distance condition, the oil was changed and the spark plugs, air filter and oil filter replaced. This was the only maintenance done prior to starting durability testing. For purposes of maintenance schedules, these items were counted as through they were performed at the zero distance point.

Plymouth Distance Accumulation Chronology

Initial durability emissions testing was performed on 12/29/77. The emissions test series is shown in Table 4, Section III-2. This test series was counted as a 965 km (600 mile) test. The car was driven for 320 km (200 miles) on the AMA distance accumulation schedule between the two replicate tests. Distance accumulation started on January 4, 1978. The car was driven on the distance accumulation course shown in Figure 4, Section II, for two eight hour shifts per day, five days per week. Approximately 640 km (400 miles) were accumulated each day. Duplicate emission tests were performed every 8050 km, with 805 km (500 miles) of the durability driving schedule between the two duplicate tests, to provide equivalent catalyst sulfate conditioning for each test. Scheduled maintenance was performed every 12,070 (7500 miles) as specified in the 1977 Plymouth Service Manual. A summary of the required maintenance is shown in Table 18. Some unscheduled maintenance was required. Figure 17 shows what unscheduled maintenance was performed and indicates the accumulated distance at which it occurred. A graphical representation of the distance accumulation records is presented in Figure 17. The figure shows daily distance, maintenance and emissions test points. Starting with the 8050 km (5000 mile) test point, at least one of FTP gaseous emissions exceeded the project limit at each test point. Considerable time was spent at each emission test series investigating the reasons for the high emission levels and replacing some of the emission control system parts. The details of these investigations are covered in the discussion of the emission test results in the next subsection.

The car accumulated 32200 km (20000 miles) on June 1, 1978. At that time the durability testing was stopped because the CO and NO_x emissions were above the project goals, with no possibility of reduction in emission levels as distance accumulation continued.

Fury Fuel and Oil Consumption

The average fuel and oil consumption for each interval between emission tests is shown in Table 19. The fuel consumption is quite consistent between emission tests at the level expected. Since there were only 4 quarts (3.8 litres) of oil added during the 32633 km (20281 miles) of distance accumulation, the oil consumption in each interval appears somewhat erratic, depending on when the oil was added. However, the overall oil consumption of 1.15 ℓ/1000 km (0.25 qt/1000 miles) is ocnsidered better than average.

TABLE 19. FUEL AND OIL CONSUMPTION DURING DURABILITY TESTING FOR 1977 FURY

Distance Interval km (mile)	Fuel ℓ/100 km (mpg)	Oil Consumption ℓ/1000 km (qt/1000 mi.)
0-8050 (0-10,000)	16.59 (14.18)	0.214 (0.364)
8050-16,100 (5000-10,000)	16.60 (14.17)	0.068 (0.116)
16,100-24,150 (10,000-15,000)	17.45 (13.48)	0.305 (0.519)
24,150-32,200 (15,000-20,000)	no data	0.113 (0.192)
Overall	16.86 (13.95)	0.145 (0.247)

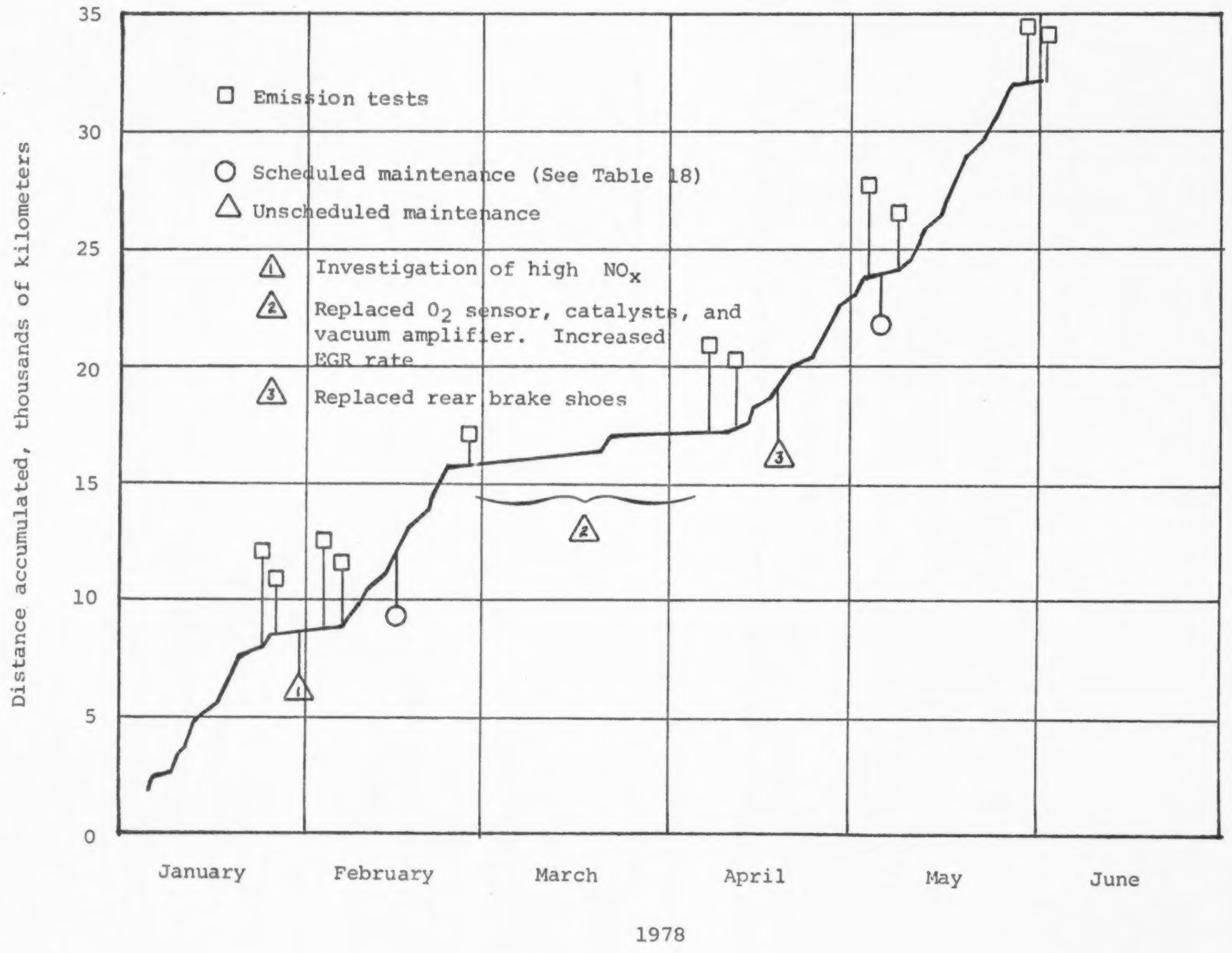


Figure 17. Distance accumulation record of 1977 Plymouth Fury

TABLE 18. MAINTENANCE SCHEDULE FOR 1977 FURY

LUBRICATION AND MAINTENANCE SCHEDULES

REQUIRED MAINTENANCE SERVICES FOR EMISSION CONTROL AND PROPER VEHICLE PERFORMANCE

	MILEAGE INTERVALS MILEAGE IN THOUSANDS		7.5	15	22.5	30	37.5	4.5
AUTOMATIC CHOKE	CHECK AND ADJUST AS REQUIRED	AT				●		
CARBURETOR CHOKE SHAFT	APPLY SOLVENT EVERY SIX MONTHS	OR	●	●	●	●	●	●
CARBURETOR AIR FILTER	REPLACE	AT				●		
COOLING SYSTEM	CHECK AND SERVICE AS REQUIRED EVERY 12 MONTHS	OR		●		●		●
CRANKCASE INLET AIR CLEANER	CLEAN	AT				●		
ENGINE OIL	CHANGE EVERY SIX MONTHS	OR	●	●	●	●	●	●
ENGINE OIL FILTER	REPLACE AT INITIAL OIL CHANGE AND EVERY 2ND OIL CHANGE THEREAFTER							
FAST IDLE CAM AND PIVOT PIN	APPLY SOLVENT EVERY SIX MONTHS	OR	●	●	●	●	●	●
FUEL FILTER	REPLACE	AT				●		
IDLE SPEED AND AIR-FUEL MIXTURE	CHECK AND ADJUST AS REQUIRED	AT		●		●		●
IGNITION CABLES	CHECK AND REPLACE AS REQUIRED AT TIME OF SPARK PLUG REPLACEMENT							
MANIFOLD HEAT CONTROL VALVE	APPLY SOLVENT	AT				●		
POSITIVE CRANKCASE VENT VALVE	CHECK OPERATION AND REPLACE IF NECESSARY			●				●
POSITIVE CRANKCASE VENT VALVE	REPLACE	AT				●		
SPARK PLUGS (WITHOUT CAT. CONV.)	REPLACE	AT		●		●		●
SPARK PLUGS (WITH CAT. CONV.)	REPLACE	AT				●		
TAPPET ADJUSTMENT 6 CYL. ENG.	CHECK AND ADJUST AS REQUIRED	AT		●		●		●
UNDERHOOD RUBBER AND PLASTIC COMPONENTS (EMISSION HOSES)	INSPECT AND REPLACE IF NECESSARY	AT		●		●		●
VAPOR STORAGE CANISTER FILTER ELEMENT	REPLACE	AT				●		

Inspection and Service should also be performed anytime a malfunction is observed or suspected. Retain receipts for all vehicle emission services to protect your emission warranty.

RECOMMENDED MAINTENANCE SERVICES

POWER STEERING	CHECK FLUID LEVEL	EVERY OIL CHANGE
EXHAUST SYSTEM	CHECK FOR LEAKS, MISSING OR DAMAGED PARTS	EVERY 6 MONTHS
BRAKE MASTER CYLINDER	INSPECT FLUID LEVEL	EVERY 6 MONTHS
TRANSMISSION	INSPECT FLUID LEVEL	EVERY 6 MONTHS
BRAKE & POWER STEERING HOSES	CHECK FOR DETERIORATION OR LEAKS	EVERY 6 MONTHS
AIR CONDITIONED CARS	CHECK BELTS, SIGHT GLASS & OPERATION OF CONTROLS	EVERY 6 MONTHS
BALL JOINTS, STEERING LINKAGE, AND UNIVERSAL JOINTS	INSPECT SEALS	EVERY 6 MONTHS
HOOD LOCK, REL. MECH. & SAFETY CATCH	LUBRICATE	EVERY 6 MONTHS
DRIVE BELTS	CHECK CONDITION & TENSION	EVERY OIL CHANGE
UPPER AND LOWER CONTROL ARM BUSHINGS	INSPECT	EVERY OIL CHANGE
TIRES	ROTATE	EVERY 10,000 MILES
COOLING SYSTEM	DRAIN, FLUSH & REFILL	AT 24 MONTHS OR 30,000 MILES AND EVERY 12 MONTHS OR 15,000 MILES THEREAFTER
BRAKE LININGS	INSPECT	EVERY 15,000 MILES
FRONT WHEEL BEARINGS*(1)	INSPECT	EVERY 22,500 MILES
AUTOMATIC TRANSMISSION—SEVERE USAGE ONLY	CHANGE FLUID & FILTER, ADJUST BANDS	EVERY 24,000 MILES
BALL JOINTS & TIE ROD ENDS	LUBRICATE	EVERY 3 YEARS OR 30,000 MILES

NOTE: Local driving conditions, or special equipment such as high performance or heavy duty options may require special service recommendations.

* Inspect the front wheel bearings whenever the brake drums or rotors are removed to inspect or service the brake system.

(1) Severe usage such as police or taxi service involving frequent or continuous brake application: Lubricate every 9,000 miles.

Fury Emission Test Results

The average test results from the five duplicate test series run on the Fury during durability testing are listed in Table 20. The emissions are shown graphically as a function of distance accumulated in Figures 18 and 19. As can be seen from the table and figures, all emissions were within the project goals at 965 km (600 miles).

At 8050 km (500 miles) NO_x was above the project goal. Some time was spent investigating the cause of the high NO_x emissions. While no reason could be found for the high NO_x, another test series was run with NO_x levels at the project goals. Both test series are shown in Table 20.

The first 16100 km (10000 miles) test produced CO and NO_x levels above the project goals. Additional testing was performed to ascertain the cause of these high emissions. Catalyst conversion efficiency for both CO and NO_x was checked. The left cylinder bank catalyst was removed from the car and radiographed to check for possible catalyst damage. No damage was found. After considerable investigation, the following adjustments and parts replacements were made:

- replaced oxygen sensor
- replaced catalyst with two Volvo catalyst (5:1 pt/pd ratio)
- increased EGR
- richened idle A/F ratio approximately two tenths of a ratio
- adjusted vacuum amplifier to hold EGR valve closed at idle

A cold start FTP was run on the test car on April 6, 1978, with the emissions once again within project limits. Two complete test series were then run. These tests are listed in Table 20 as "16100 km, after maintenance" tests.

Since 24150 km (15000 miles) was a major scheduled maintenance point, a single test series was run before and after maintenance. The before maintenance FTP emissions were all above the project goal levels. Both CO and HC emissions were approximately three times the previous (16100 km) tests. The after maintenance HC level was again within the project goals, but CO and NO_x emissions were still not within their respective goals. Nevertheless, distance accumulation was continued until 32200 km (20,000 miles).

The HC and CO emissions changed only slightly between 24150 and the 32200 km test. HC was still within the project goals and NO_x still was higher than the goals. The CO emissions almost doubled between the after maintenance 21150 km test and the 3200 km FTP test. It was obvious by then that CO emissions were going to increase at a rapid rate and could not be held even close to the project goal level. Therefore, the durability test was halted.

TABLE 20. DURABILITY TEST RESULTS FROM 1977 PLYMOUTH FURY WITH FEEDBACK CARBURETOR AND THREEWAY CATALYST

Distance Accumulation km (miles)	Gaseous Emissions g/km (g/mile)			H_2SO_4 mg/km (mg/mile)	Fuel ℓ/100 km (mpg)
	HC	CO	NO_x		
		FTP Tests			
965(600)	0.22(0.36)	1.80(2.90)	0.59(0.95)		17.84(13.21)
8050(5000)	0.16(0.25)	1.77(2.85)	0.83(1.33)		18.51(12.72)
16,100(10,000)	0.22(0.35)	2.66(4.28)	0.91(1.46)		18.52(12.70)
16,100(10,000)[a]	0.19(0.31)	2.02(3.24)	0.64(1.02)		18.18(12.95)
24,150(15,000)	0.59(0.95)	6.66(10.71)	0.85(1.37)		18.65(12.62)
24,150(15,000)[b]	0.18(0.28)	2.87(4.62)	1.08(1.74)		18.39(12.79)
32,200(20,000)	0.23(0.36)	4.79(7.70)	1.11(1.79)		20.56(11.56)
		CFDS Tests			
965(600)	0.03(0.05)	0.32(0.51)	0.73(1.18)	0.66(1.07)	
8050(5000)	0.02(0.04)	0.67(1.08)	0.78(1.26)	0.43(0.69)	
16,1000(10,000)	0.03(0.05)	1.35(2.17)	1.10(1.77)	0.37(0.60)	
16,100(10,000)[a]	0.02(0.04)	0.58(0.94)	0.60(0.98)	0.34(0.54)	
24,150(15,000)	0.02(0.04)	0.65(1.04)	1.01(1.63)	0.40(0.64)	
24,150(15,000)[b]	0.03(0.05)	1.23(1.98)	0.90(1.44)	0.42(0.68)	
32,200(20,000)	0.04(0.06)	1.88(3.03)	1.03(1.63)	0.76(1.23)	
		HFET Tests			
965(600)	0.02(0.04)	0.17(0.28)	0.82(1.32)		12.14(19.38)
8050(5000)	0.02(0.03)	0.36(0.58)	0.84(1.36)		11.79(19.96)
16,100(10,000)	0.02(0.03)	0.90(1.45)	1.12(1.80)		12.49(18.83)
16,100(10,000)[a]	0.02(0.04)	0.40(0.63)	0.53(0.84)		11.70(20.10)
24,150(15,000)	0.03(0.05)	0.81(1.31)	0.96(1.55)		11.80(19.94)
24,150(15,000)	0.02(0.04)	0.87(1.40)	0.78(1.25)		11.63(20.22)
32,200(20,000)	0.02(0.04)	1.28(2.06)	0.84(1.37)		10.94(21.53)

[a] After maintenance tests

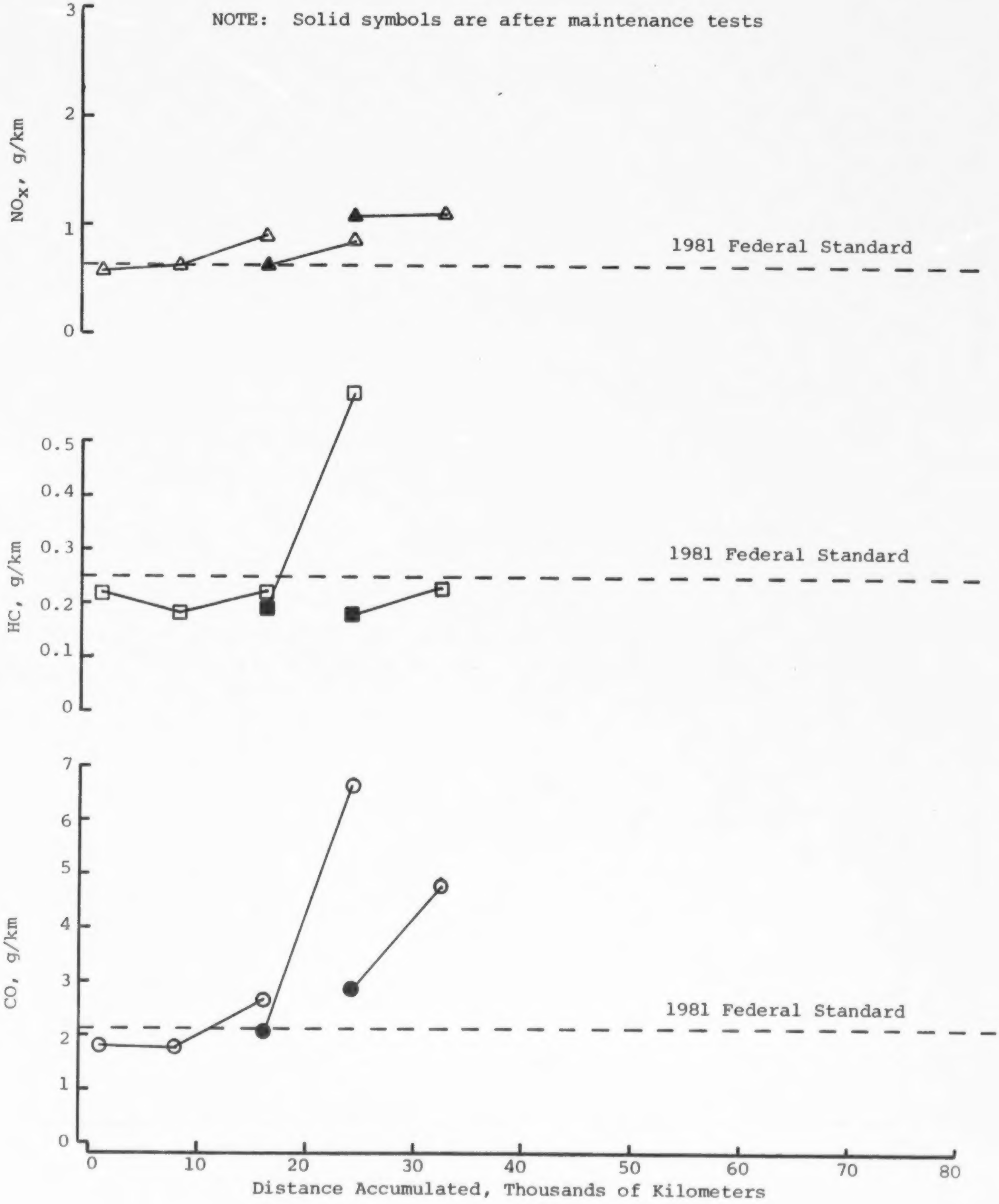


Figure 18. Emissions as a function of distance accumulated for a 1977 Fury with 3-way catalyst and feedback carburetor

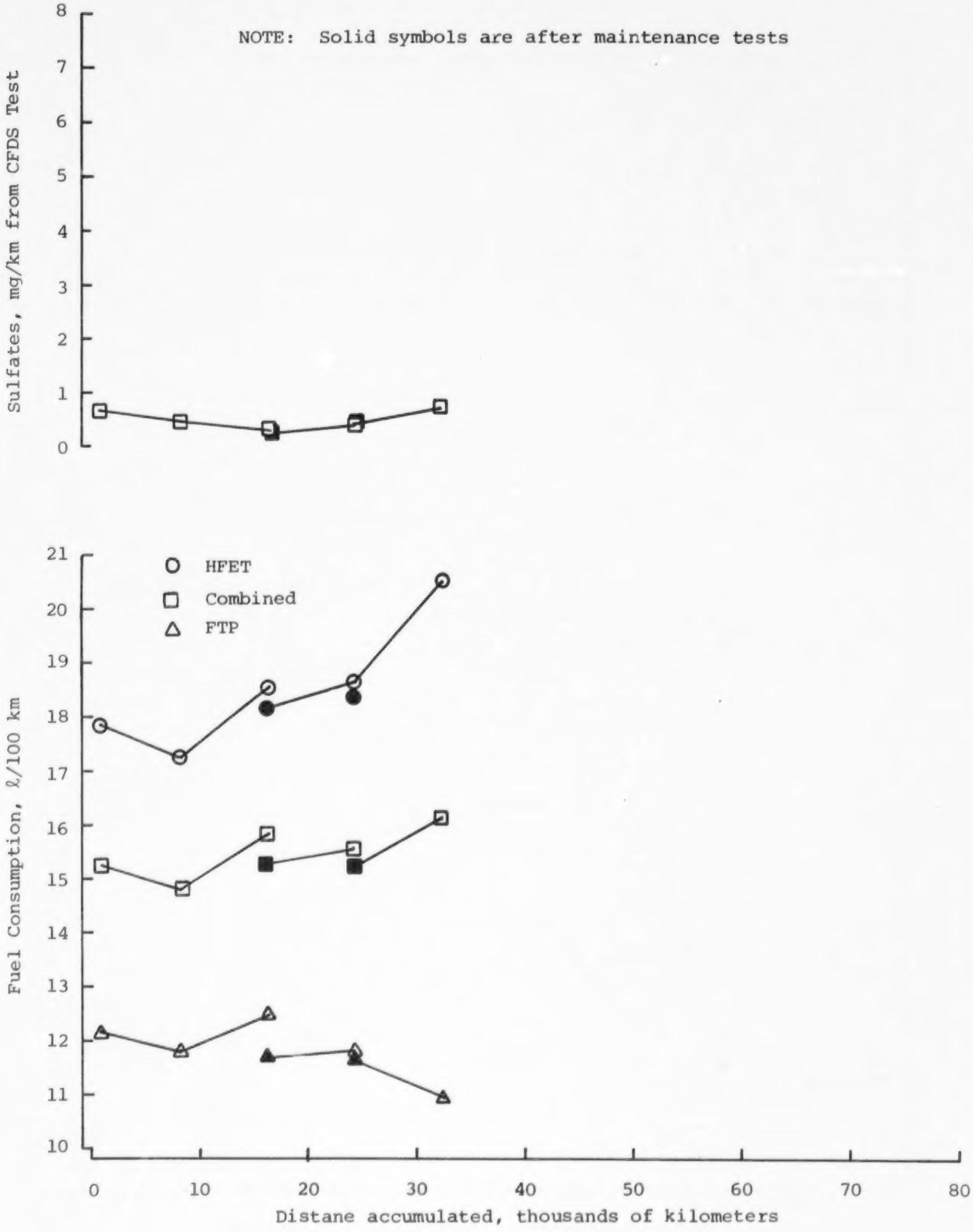


Figure 19. Fuel consumption and sulfates as a function of distance for a 1977 Fury with feedback carburetor

Examining Figures 18 and 19, it can be seen that the HC levels were above the project goal at only one point, the 24,150 km before maintenance test; after maintenance it returned to the levels of the three previous emission tests. While the NO_x emissions had been above the project goals from 8050 kilometers onward, the increase was fairly gradual and appeared to be leveling off. Thus, it is possible that this system installed on a different car, with somewhat lower initial emissions, might meet the 1981 HC and NO_x standards, but it is doubtful that this vehicle could ever meet the 1981 CO standards after 80,500 km (50,000 miles) of durability distance accumulation.

Unregulated Emissions

Emissions of ammonia, total cyanide and methane were measured during the 24100 and 23300 km test series. These emissions are presented in Tables 21 and 22. As was stated in the presentation of unregulated emissions for the Nova in Section III-3B, there is little that can be said about the absolute levels of these emissions, since there are no standards against which they could be compared. However, a comparison of levels between the two cars tested may be of value. FTP methane levels as a percent of the total hydrocarbons are approximately the same for the two cars, at about 40 percent of the total hydrocarbons. Cyanide levels of all tests form the Fury are the same order of magnitude as those from the Nova. As would be expected from a threeway catalyst system, ammonia emissions from the Fury are 5 to 10 times ammonia emissions from the Nova. The HFET tests on the Fury appear to produce the highest ammonia levels. Simply because ammonia emissions from the Fury are an order of magnitude greater than those from the Nova, does not imply that ammonia emissions from the Fury should be of concern. That can only be determined by consideration of what levels might be hazardous. Such consideration was not part of this project. However, Reference 27 contains a discussion of a method for grossly estimating the importance of a number of unregulated emissions for those interested in persuing the subject further.

TABLE 21. UNREGULATED EMISSIONS FROM 1977 PLYMOUTH FURY WITH FEEDBACK CARBURETOR AND THREEWAY CATALYST - 24100 km

Date	Test Type	Ammonia mg/km	Total Cyanide mg/km	Methane g/km	Non-Methane HC g/km
5/3/78	FTP	31.80[b]	0.09[b]	0.10	0.49
5/8/78	FTP[c]	4.31[b]	0.04[b]	0.07	0.11
5/3/78	CFDS	27.93	0.03	0.01	0.01
5/8/78	CFDS[c]	51.24	0.06	0.01	0.02
5/3/78	HFET	33.90	0.14	0.02	0.01
5/8/78	HFET[c]	70.53	0.11	0.01	0.01

[a] Total cyanide is cyanide (HCN) plus cyanogen (C_2N_2)

[b] Single unweighted sample for all of FTP test

[c] Test on 5/3/78 after maintenance

TABLE 22. UNREGULATED EMISSIONS FROM 1977 PLYMOUTH FURY WITH FEEDBACK CARBURETOR AND THREEWAY CATALYST - 32200 km

Date	Test Type	Ammonia mg/km	Total Cyanide[a] mg/km	Methane g/km	Non-Methane HC g/km
5/29/78	FTP	25.22[b]	0.11[b]	0.10	0.12
6/1/78	FTP	48.67[b]	0.37[b]	0.08	0.16
Average		36.95	0.24	0.09	0.14
5/29/78	CFDS	49.79	0.03	0.02	0.02
6/1/78	CFDS	64.39	0.01	0.01	0.02
Average		57.09	0.02	0.02	0.02
5/29/78	HFET	68.34	0.22	0.02	0.01
6/1/78	HFET	103.98	0.26	0.01	<0.01
Average		86.16	0.24	0.02	0.01

[a] Total cyanide is cyanide (HCN) plus cyanogen (C_2N_2)

[b] Single unweighted sample for all of FTP test

IV. PHASE II - OPTIMIZATION AND DURABILITY TESTING OF THREEWAY PLUS OXIDATION CATALYST SYSTEM

The two low sulfate emission control systems originally chosen and tested for durability, were not able to maintain gaseous emissions within the 1981 standards as distance accumulation progressed. In a continuation of the effort to meet the project goals, a different emission control system and test car were selected to undergo optimization and durability testing. The emission control system was a threeway catalyst, plus an air injected oxidation catalyst. The system was installed on a 1978 California Volvo sedan with a four cylinder engine. This part of the project is designated as Phase II.

IV.1. TEST VEHICLE, EMISSION CONTROL SYSTEM AND TEST PLAN

Following the decision to terminate testing of the two low sulfate emission cars, a meeting was held at Ann Arbor, Michigan, between EPA and SwRI representatives to discuss the direction the project should take. Both emissions control systems that were undergoing tests, the threeway catalyst with feedback carburetor, and the air modulation system demonstrated the ability to keep sulfate emissions low. Their problem was a rapid deterioration of gaseous emissions. It was felt that a different fuel system, such as a feedback fuel injection system, might provide less rapid deterioration.

From information provided to EPA by the automotive manufacturers, it appeared that fuel injection and threeway plus oxidation catalysts would be two of the approaches to meeting the 1981 Federal standards.(31) Therefore, it was decided to change the demonstration vehicle and emission control system to ones more closely resembling what was planned by manufacturers for 1981. The new vehicle would be obtained, the emission control system installed and optimized, and as much durability testing completed as the funds remaining permitted.

A. Vehicle Selection and Description

Three considerations dominated the choice of test vehicle. The first was the stock emission control system. A threeway catalyst with feedback fuel control, preferably fuel injected, was desired. The second consideration was vehicle size. A vehicle that would be considered medium size in 1981, capable of carrying at least five passengers, was desired. It was judged that this size car would probably have a curb weight of approximately 1360 kg (3000 lbs). The third consideration was fuel economy. The fuel economy standards for 1981 require a CAFE value of 22 miles per gallon. A manufacturer with a complete vehicle mix of large, medium and small cars would require a medium size, five passenger car, having a fuel economy approximately equal to the CAFE standard. Therefore, the car chosen should have a combined fuel economy of approximately 10.7 ℓ/100 km (22 mpg).

After consideration of several vehicles, a four-cylinder, 1978 Volvo, with the Lambda-Sond emission control system was chosen as the best readily available car meeting the selection considerations. A description of the car is presented in Table 23. Photographs of the car and engine compartment are shown in Figure 20.

B. Emission Control System

The stock emission control system on the California version of the Volvo 244 is a threeway catalytst, feedback fuel injection system, named the "Lambda-Sond" system by Volvo. The stock Lambda-Sond emission control system is shown

TABLE 23. DESCRIPTION OF PHASE II TEST CAR

Manufacturer	Volvo
Model	244DL
Model year	1978
Vehicle Identification No. (VIN)	24445L1-309507
Emission family designation	4CL/E1
Engine displacement, litres (cu.in.)	2.1(130)
No. of cylinders and configurations	I4
Transmission	3 speed auto.
Ignition timing	12° BTC @ 750 rpm
Idle rpm	900 rpm
Fuel system	Volvo "CI" fuel injection
Rear axle ratio	3.91
Tires	175 SR 14
Stock Emission Control System	California Lambda-Sond (threeway catalyst w/feedback fuel injection)
Inertia weight class (lbs)	3500

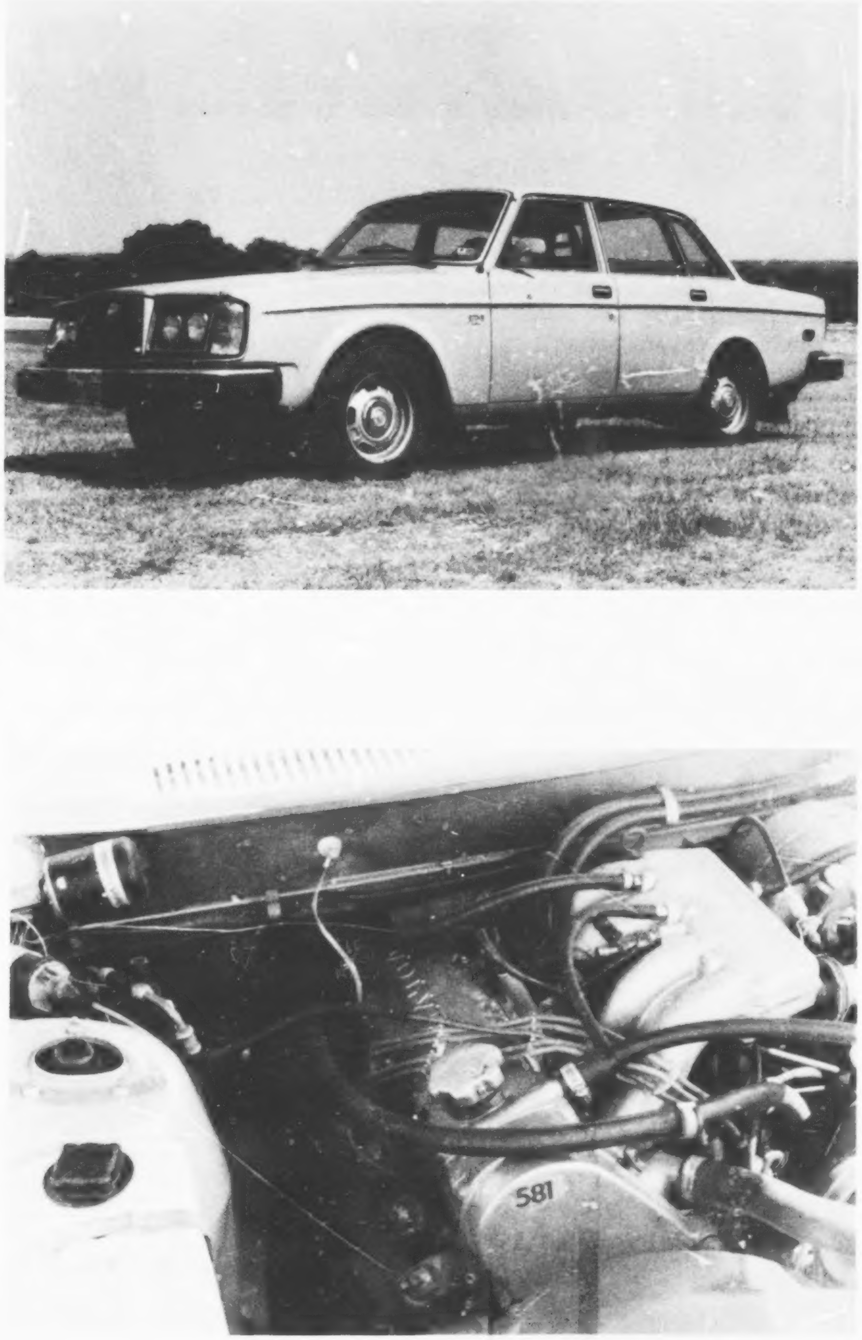


Figure 20. 1978 Volvo 244 test car

in Figure 21. This system is used with the mechanical fuel injection system, shown in Figure 22.

One way to reduce CO emissions from this system is to install an oxidation catalyst downstream of the threeway catalyst and provide air for oxidation by means of air injection between the two catalysts. This threeway plus oxidation catalyst system was in use on the 1978 Ford Pinto in California and was actively being investigated by a number of automobile manufacturers. The drawback to this system is that the air injected oxidation catalyst can produce large amounts of sulfate. However, it was demonstrated in Phase I of this project that modulated air injection can significantly reduce the sulfate emissions from an oxidation catalyst.

Therefore, the new system chosen to meet the project goals of a low sulfate system capable of meeting the 1981 gaseous emission standards was a feedback fuel injection system with a threeway plus modulated air injected oxidation catalyst.

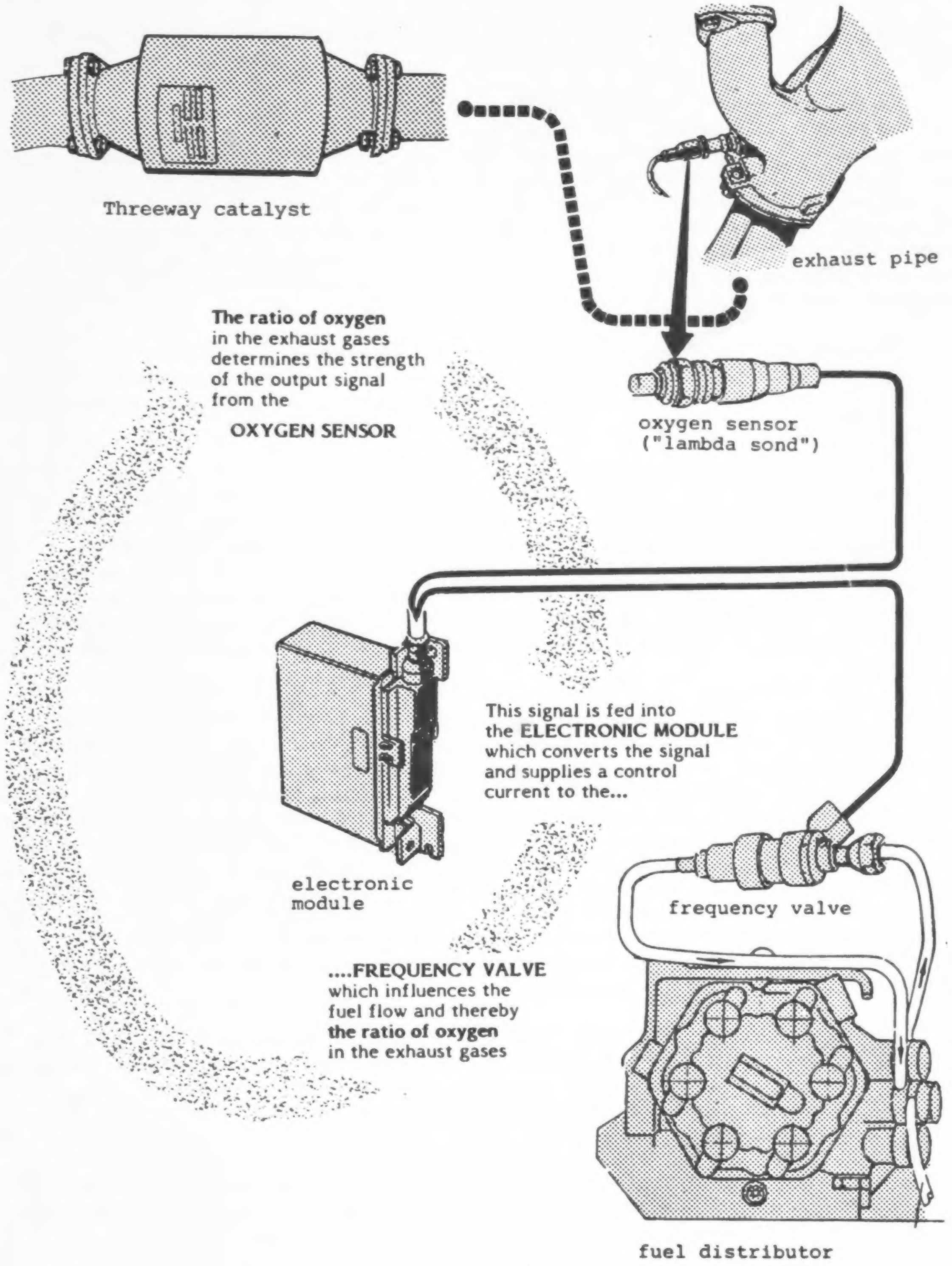
An additional technique was planned for evaluation on the test car. This technique was to use the stock emission control system, but to add air injection to the exhaust manifold only during the first minute or so of the cold start to provide air for CO and HC oxidation in the manifold during the catalyst warmup. Since a large part of the CO emitted occurs during the first minute of the cold start, it is possible that this technique could work. As an example, on the 20,000 mile test of the Fury with threeway catalyst, listed in Section III-4, 61 percent of the CO was produced during the cold start 505 second portion of the test.

A cold start exhaust manifold air injection system also fitted into the modulated air injection system already planned. In fact, the 1978 California Pinto included this feature in its emission control system. While the EPA had suggested using reed valve exhaust manifold air injection during the cold start, it was felt that using the air pump already installed was a more expedient method of demonstrating this concept. Since the exhaust manifold injection system was already part of the emission control system, to test it alone, the oxidation catalyst is removed and the air injection to the oxidation catalyst is dumped. to atmosphere. More importantly however, aspirator design is an art. The aspirator connecting tubes must be properly tuned to obtain maximum airflow. Much time and effort could be expended in developing as aspirator only to find it produced insufficient CO control.

A sketch of the manifold air injection system is shown in Figure 23. The technique was tested during the optimization phase using an air pump to supply the air. At the conclusion of the project, this technique was again evaluated using aspirated air injection often refered to as a "pulse air" system. This system is shown in Figure 24.

The modulated air injection system was similar to the one used on the 1975 Nova in Phase 1 of this project. The details of the air injection system used are shown in Figure 25. It consisted of the following components:

- A belt driven air pump equipped with a centrifugal clutch.


Threeway catalyst
exhaust pipe
oxygen sensor
("lambda sond")
electronic
module
frequency valve
fuel distributor

The ratio of oxygen in the exhaust gases determines the strength of the output signal from the

OXYGEN SENSOR

This signal is fed into the **ELECTRONIC MODULE** which converts the signal and supplies a control current to the...

....FREQUENCY VALVE which influences the fuel flow and thereby **the ratio of oxygen** in the exhaust gases

Figure 21. Lambda-Sond system

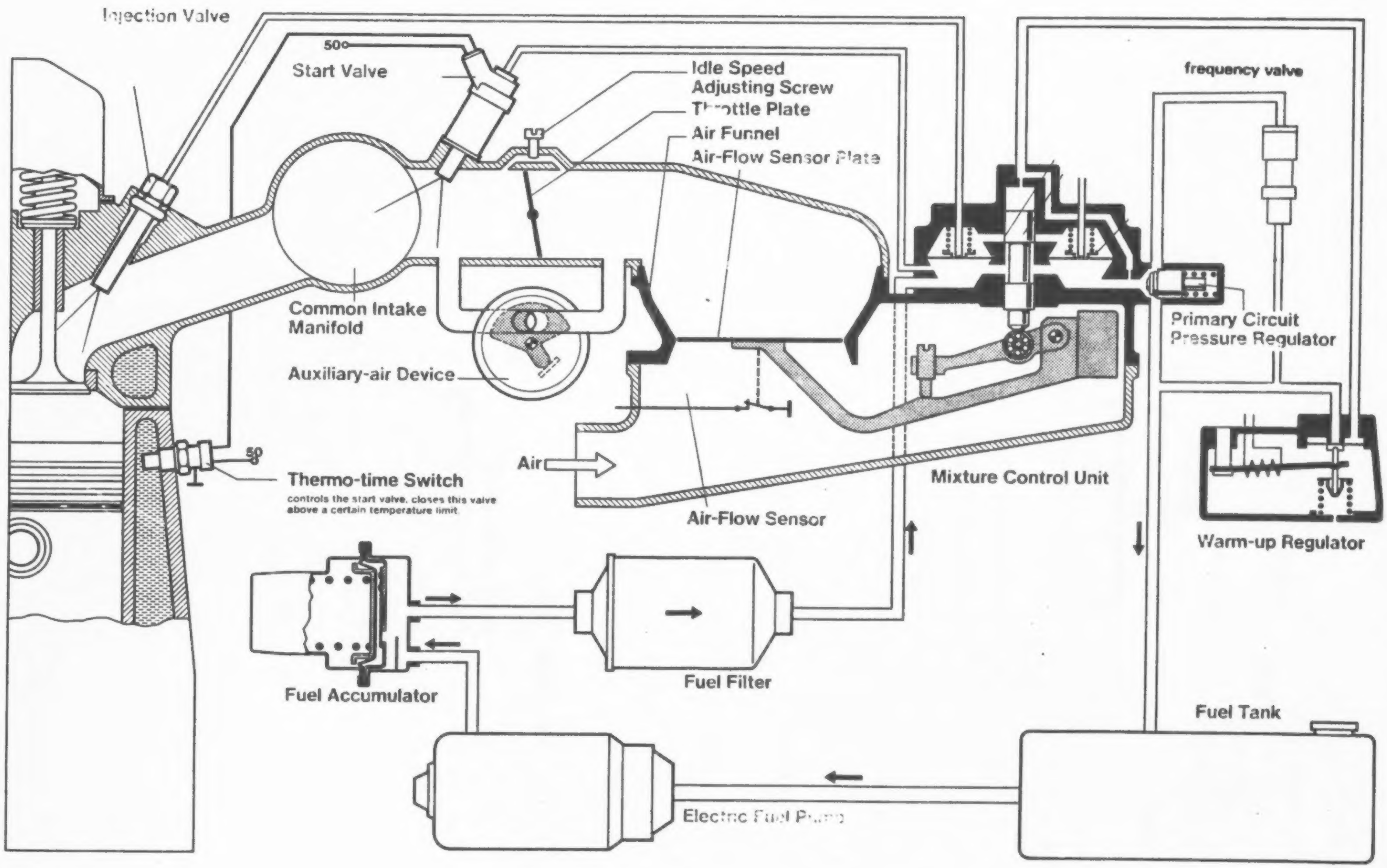

Injection Valve
50
Start Valve
Idle Speed Adjusting Screw
Throttle Plate
Air Funnel
Air-Flow Sensor Plate
frequency valve
Common Intake Manifold
Primary Circuit Pressure Regulator
Auxiliary-air Device
50
Thermo-time Switch
controls the start valve, closes this valve above a certain temperature limit.
Air
Mixture Control Unit
Air-Flow Sensor
Warm-up Regulator
Fuel Accumulator
Fuel Filter
Fuel Tank
Electric Fuel Pump

Figure 22. Fuel injection system

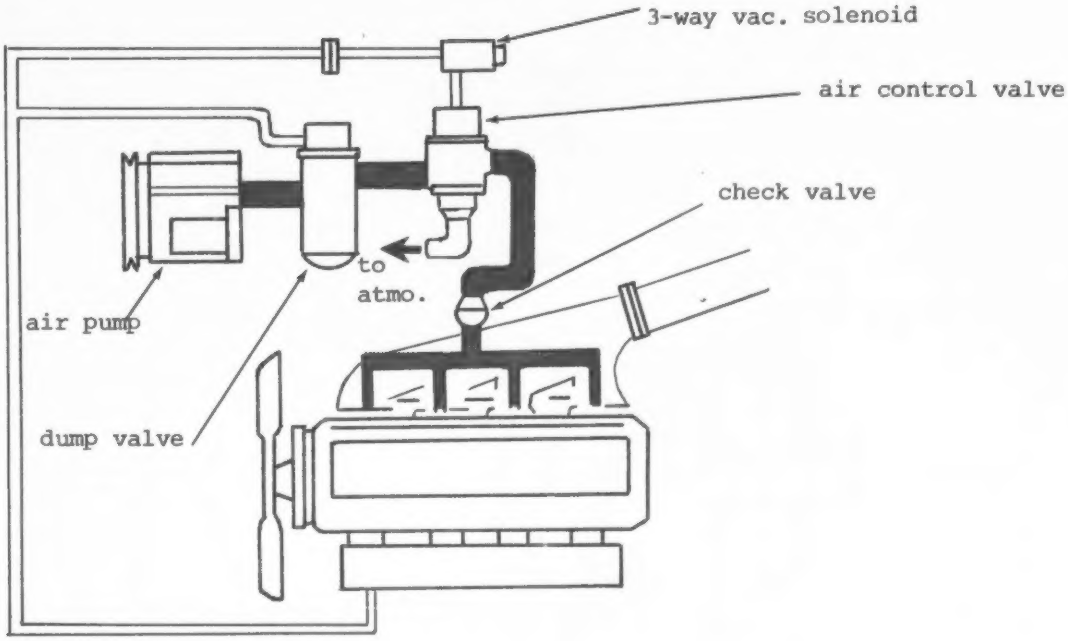

3-way vac. solenoid
air control valve
check valve
to
atmo.
air pump
dump valve

Figure 23. Air pump exhaust manifold injection

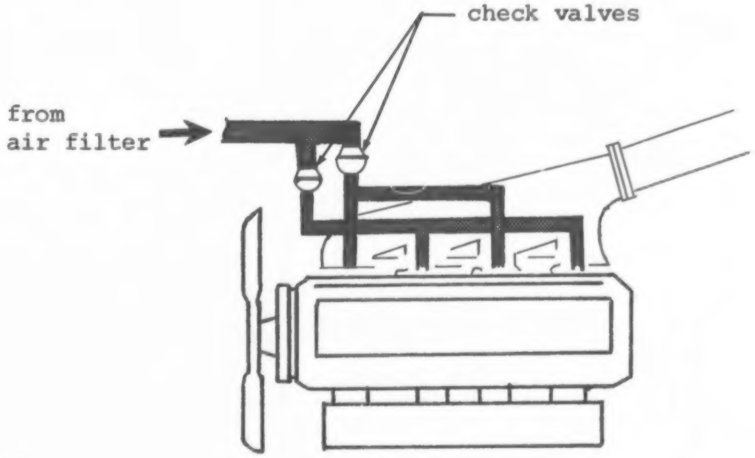

check valves
from
air filter

Figure 24. Aspirated exhaust manifold injection

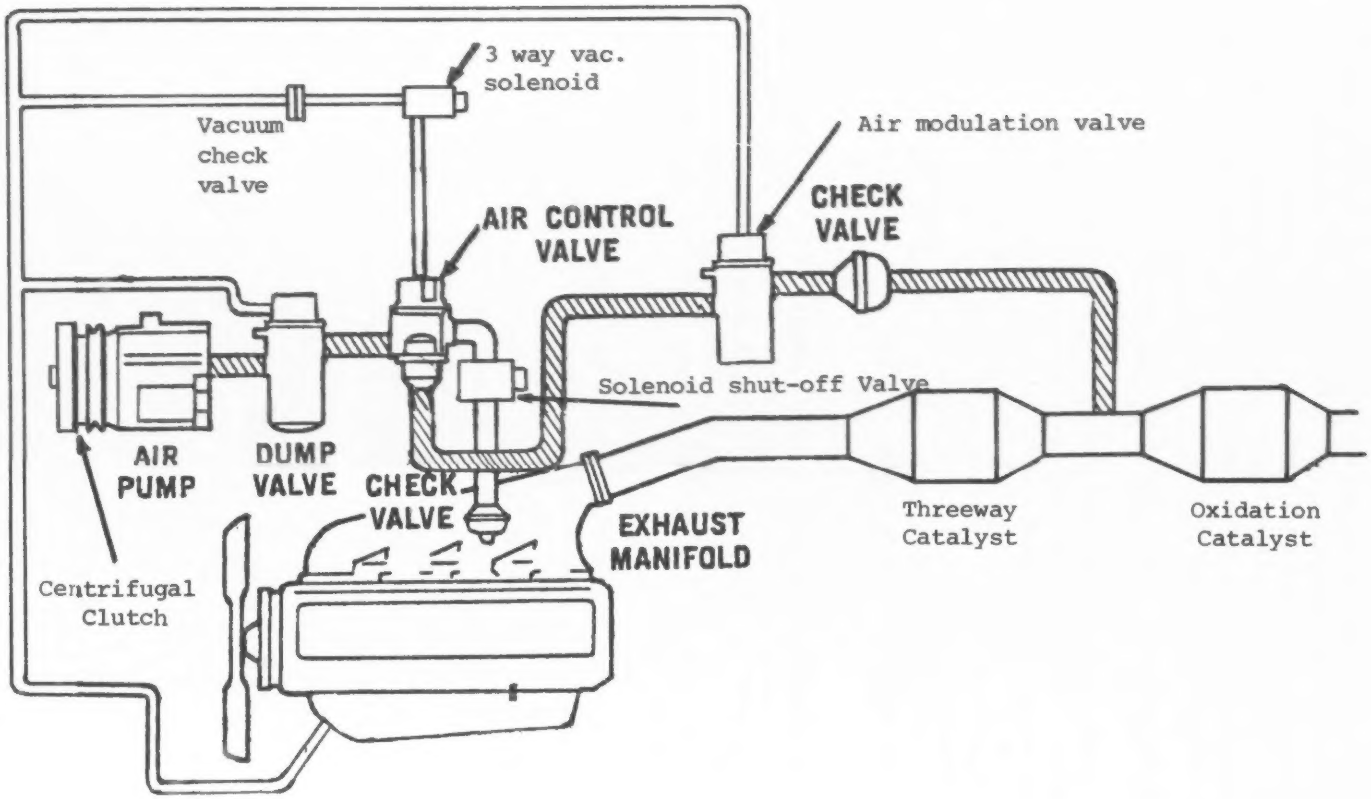

3 way vac. solenoid
Vacuum check valve
Air modulation valve
CHECK VALVE
AIR CONTROL VALVE
Solenoid shut-off Valve
AIR PUMP
DUMP VALVE
CHECK VALVE
EXHAUST MANIFOLD
Threeway Catalyst
Oxidation Catalyst
Centrifugal Clutch

Figure 25. Air injection system

- The standard air pump dump and relief valve controlled by manifold vacuum.

- An air control valve to switch the air from the exhaust manifold to the oxidation catalyst. Air is directed to the exhaust manifold as long as there is vacuum to the valve. A solenoid valve shuts off the vacuum and vents the control valve to atmosphere. The solenoid is accuated by a time delay relay.

- A manifold vacuum controlled air modulation valve.

The air pump, dump valve, air control valve, and check valves were stock 1978 Pinto parts. The threeway vacuum solenoid was a standard automotive type manufactured by Marvel-Schebler/Tillotson. The oxidation catalyst was the same model Ford catalyst used on the 1975 Nova in Phase I. The air pump centrifugal clutch and air modulation valve were designed and built by SwRI. Both the centrifugal clutch and air modulation valve were redesigned for this phase of the project. Figure 26 is a cross section of the redesigned centrifugal clutch and Figure 27 is a cross section of the redesigned air modulation valve.

During optimization testing, various parts of the system were bypassed or disconnected to evaluate their contribution to emission control. However, the final system used in the durability test phase included all components shown in Figure 25. As the optimization testing progressed, it became obvious that additional CO control was needed during the first minute of the cold start portion of the FTP.

Many feedback fuel systems used with threeway catalysts have an open loop circuit which operates during the first part of the cold start while the oxygen sensor is warming up. The Volvo, as far as could be determined, did not have such an open loop circuit. It was reasoned that an open loop circuit, which would provide a signal to the fuel control system to run leaner than the stock system, would reduce the cold start CO. A simple, manually switched system capable of providing from 0 to 800 mv to the electronic module was built to evaluate this technique. When it proved successful, an automatic circuit was designed and built to provide A/F ratio control during cold starts.

The circuit to generate a voltage signal to the fuel system ECU to replace the oxygen sensor voltage signal during cold starts is shown in Figure 28. A recorder trace of the voltage to the ECU during an actual cold start is shown in Figure 29. The fuel system supplies more fuel when the voltage is low and less fuel when the voltage is high. A complete schematic of all electrical circuits added to the car is shown in Figure 30. The major elements of circuitry and their function are:

- SwRI cold start circuit, whose function is explained above.

- Thermal switch in cooling system to cut out SwRI cold start circuit and exhaust manifold air injection when engine is warm.

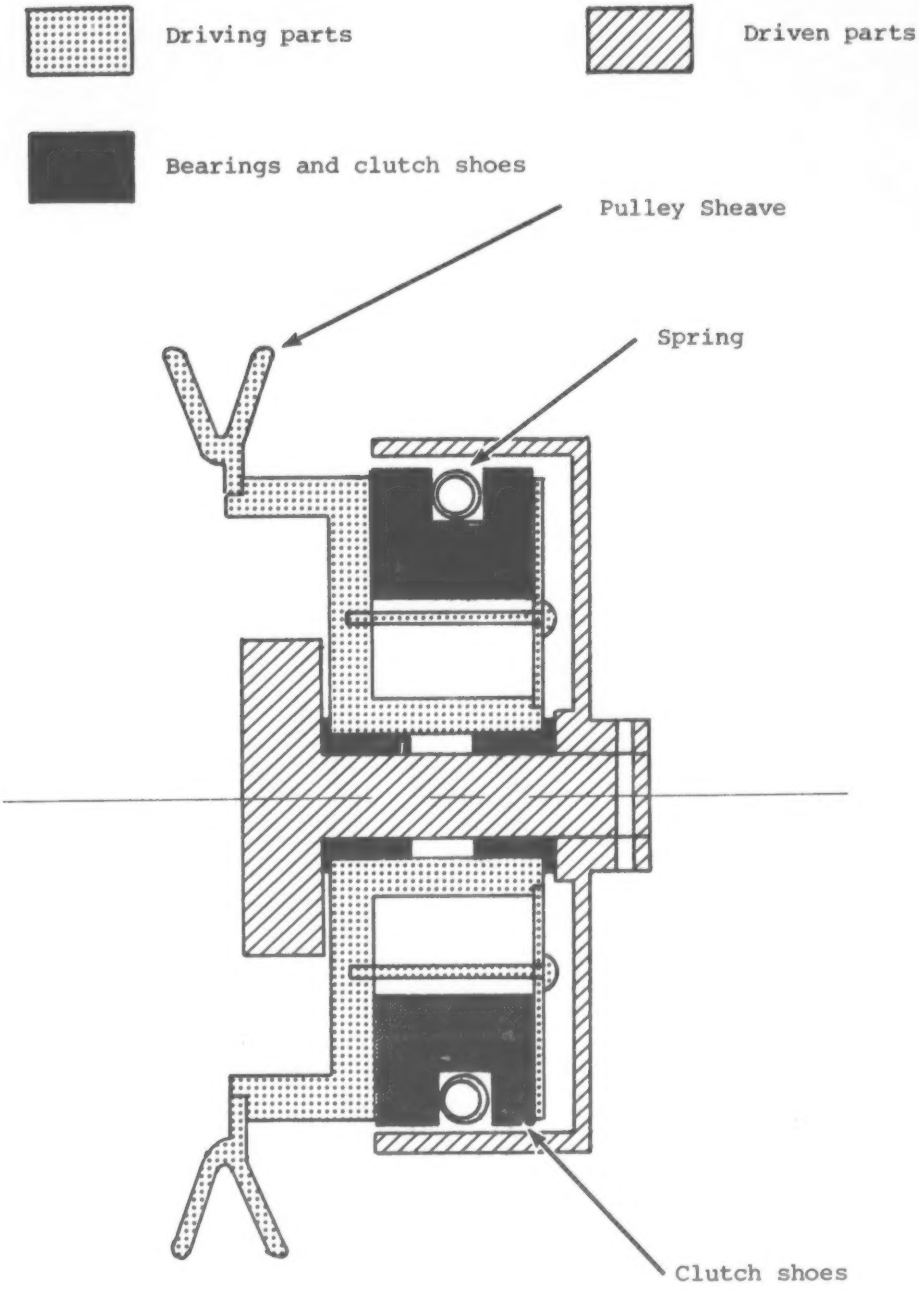

Driving parts
Driven parts
Bearings and clutch shoes
Pulley Sheave
Spring
Clutch shoes

Figure 26. Redesigned centrifugal clutch

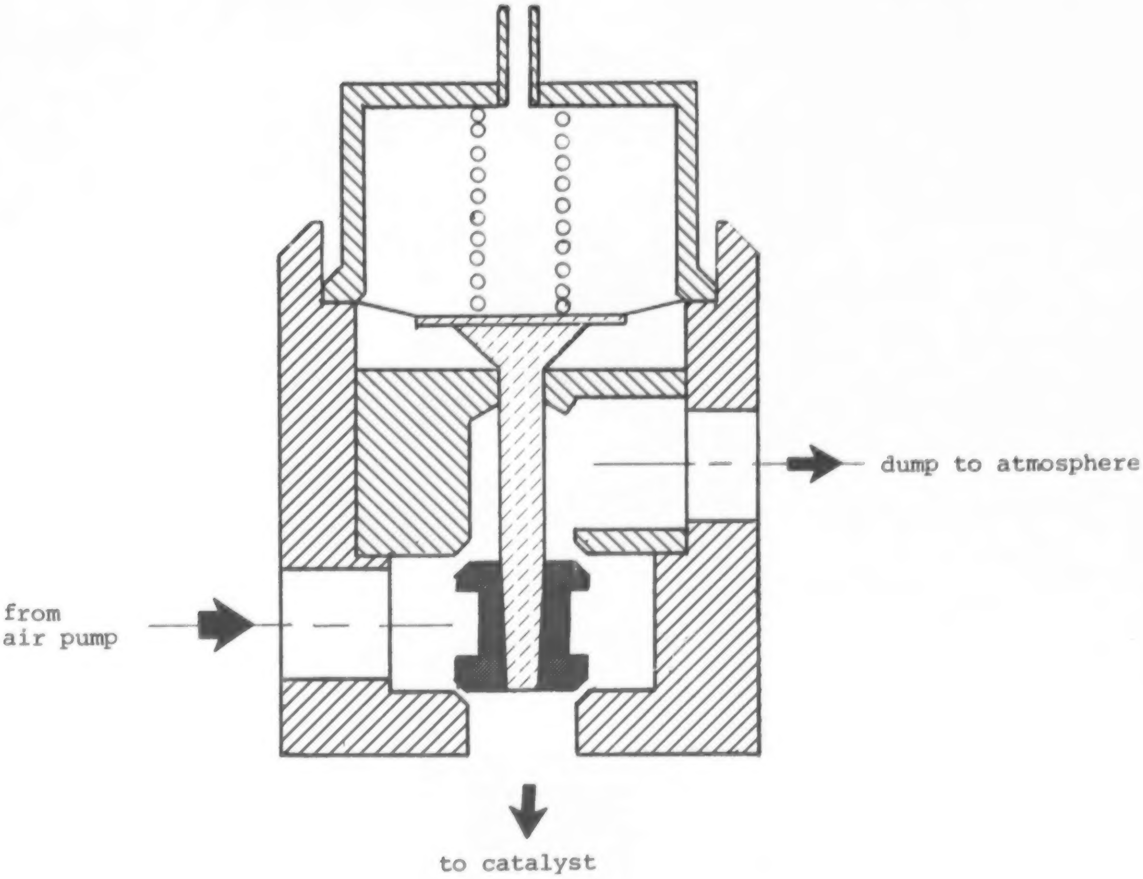

dump to atmosphere
from
air pump
to catalyst

Figure 27. Redesigned air modulation valve

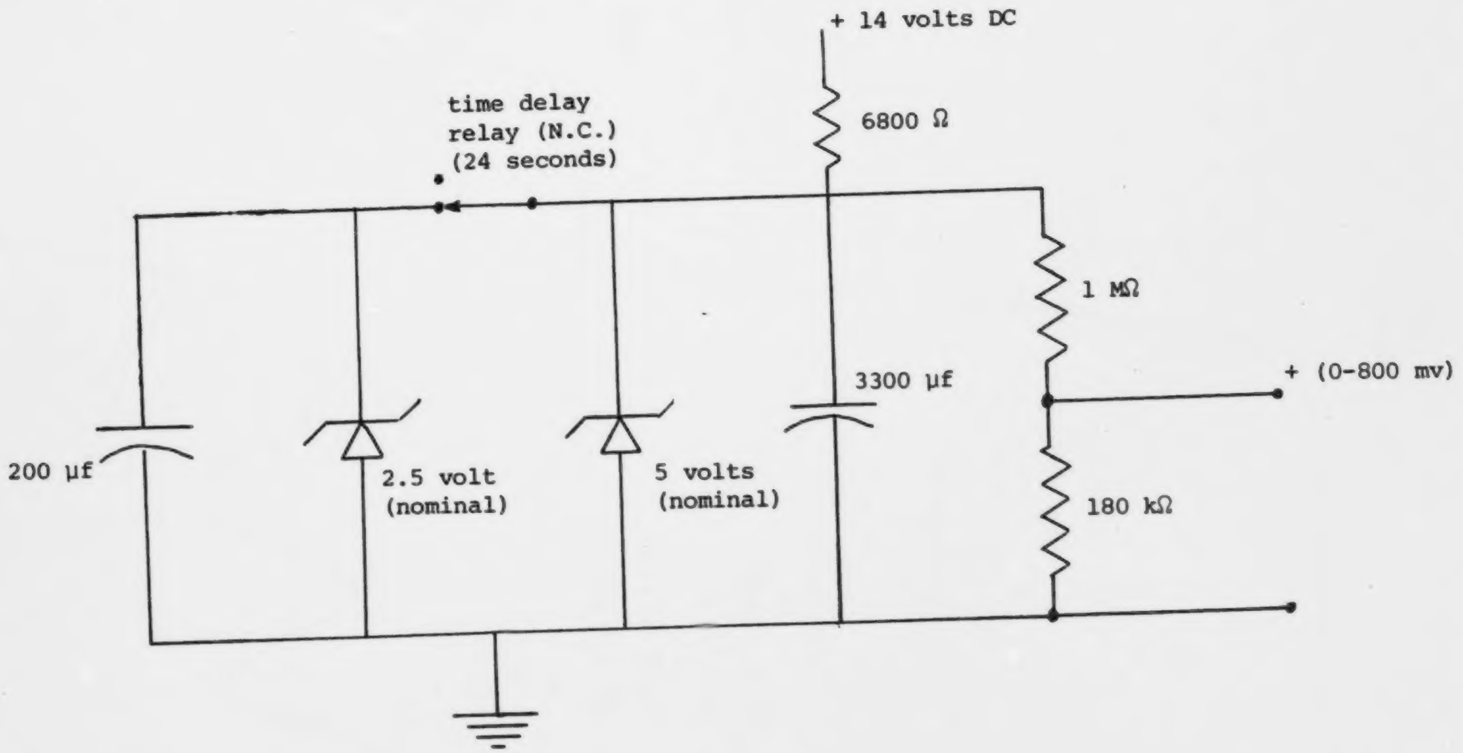

+ 14 volts DC
6800 Ω
time delay
relay (N.C.)
(24 seconds)
1 MΩ
+ (0-800 mv)
3300 µf
200 µf
2.5 volt
(nominal)
5 volts
(nominal)
180 kΩ

Figure 28. SwRI cold start circuit for Volvo with Lambda-Sond

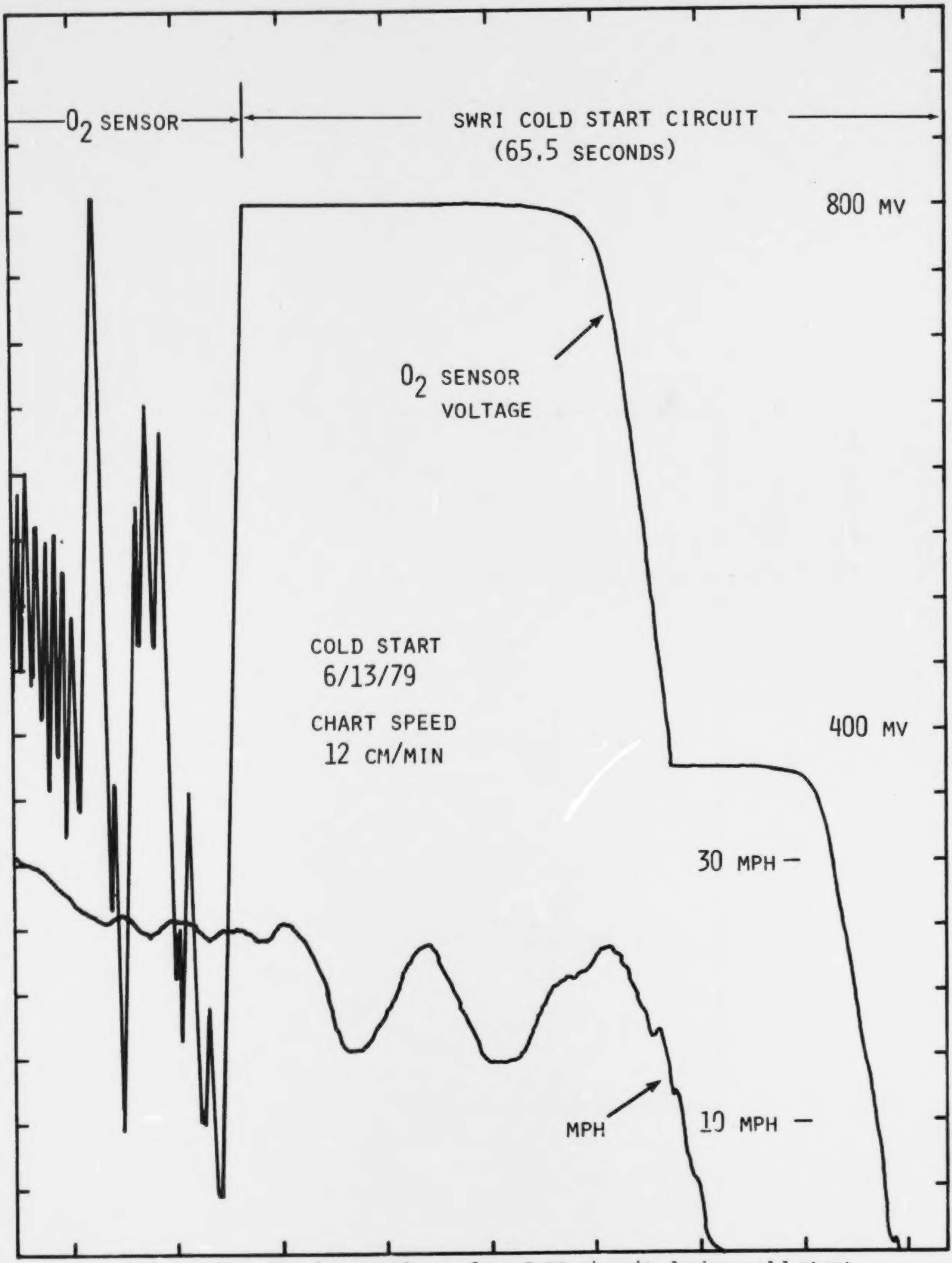


Figure 29. ECU input voltage from SwRI circuit during cold start

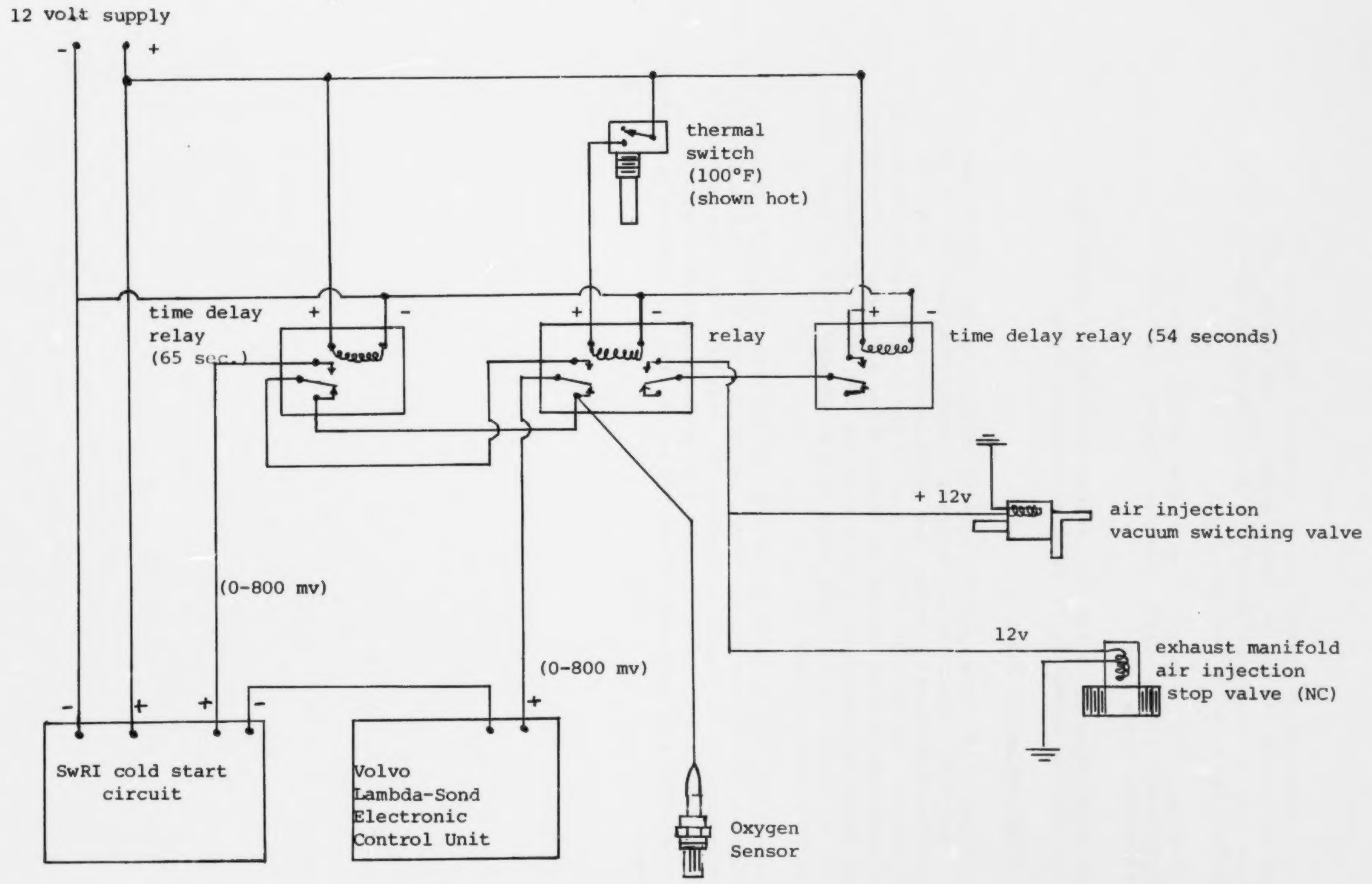

12 volt supply
-
+
thermal
switch
(100°F)
(shown hot)
time delay
relay
(65 sec.)
+
-
+
-
relay
+
-
time delay relay (54 seconds)
+ 12v
air injection
vacuum switching valve
(0-800 mv)
12v
exhaust manifold
air injection
stop valve (NC)
(0-800 mv)
-
+
+
-
+
SwRI cold start
circuit
Volvo
Lambda-Sond
Electronic
Control Unit
Oxygen
Sensor

Figure 30. Cold start circuitry for modified Volvo Lambda-Sond system

- Relay controlled by thermal switch to switch ECU input from cold start circuit to oxygen sensor. Also to switch vacuum control valve and positive shut off valve in exhaust manifold air injection system.

- Time delay relay to switch from cold start ECU input to oxygen sensor input. Delay shown on schematic is final optimization value.

- Time delay relay to switch off exhaust manifold air injection. Delay shown on schematic is final optimization value.

C. Test Organization for Phase II

The testing of the Volvo and the emission control system was divided into two parts. The first, optimization testing, included "as-received" tests, various baseline configuration tests, and optimization testing of the air modulation system. The purpose of this part of the testing was to produce an emission control system with sulfate emissions below 3.1 mg/km (5.0 mg/mile) and gaseous emissions low enough to be within the 1981 emission standards after 80500 km (50,000 miles). The same test procedures used in Phase I of the project were used in Phase II.

The second part was durability testing, in which the car with emission control system installed was driven 64400 km (40,000 miles) on the durability driving schedule shown in Figure 4, Section II. Emission tests were performed every 8050 km (5000 miles) using the same test procedures as were used in Phase I. The details of each part of the system testing are covered in sections that follow.

IV-2. OPTIMIZATION TESTING

The modulated air system optimization for low gaseous emissions and low sulfates took place between August 1978 and March 1979. The test plan called for a series of baseline tests in various hardware configurations, while accumulating approximately 5950 km (3700 miles) on the car. This distance accumulation was necessary to properly age the catalyst. Experience gained with the 1975 Nova in Phase I of this project demonstrated the need to age the catalyst prior to optimization, so as not to be misled by extremely low CO emissions from a green catalyst.

Since the concept of modulating the air to an oxidation catalyst had been demonstrated in Phase I of this project, the main emphasis of the Volvo optimization testing was to reduce FTP gaseous emissions to a level that would allow the car to meet the 1981 gaseous emission standards after 80,500 km (50,000 miles) of durability testing.

The project goal was to meet emission levels of 0.25 g/km (0.41 g/mile) HC, 2.11 g/km (3.4 g/mile) CO, and 0.62 g/km (1.0 g/mile) NO_x at 80,500 km (50,000 miles). Realistic deterioration factors with threeway catalyst appeared to be 1.5 for HC, 2.0 for CO and 3.0 for NO_x.(30) Therefore, the gaseous emissions goals at the end of optimization (6500 km or 4000 miles) were set at 0.17 g/km (0.27 g/mile) HC, 1.06 g/km (1.7 g/mile) CO, and 0.21 g/km (0.33 g/mile) NO_x. The sulfate goal at 80,500 km was 3.11 g/km (5.0 g/mile) on the CFDS test. Since sulfates usually decrease with mileage(7,29), this was the goal at 6500 km also.

The plan was to run an "as-received" test series on the car, then install the air modulation system and begin distance accumulation. The test series used for this and all subsequent testing is shown in Table 24. From the beginning, the testing did not proceed smoothly. Higher than expected CO emissions from the as-received tests, and confusion over the correct idle intake manifold vacuum caused additional unscheduled tests and prolonged the actual optimization testing.

Confusion over the correct idle vacuum resulted when the idle intake manifold vacuum was measured at 10 inches of mercury gauge. This value is considerably different from the 16 to 18 inches of mercury normally seen on carbureted engines of U.S. manufacturer. Conflicting information was at first received from Volvo of America and the local area Service Representative. The final outcome was that 10 inches of mercury was a reasonable level of idle vacuum for B21F Volvo engines.

Over 40 emissions tests were performed during the optimization of the modulated air injection system. The tests were performed with the car in one

TABLE 24. PHASE II TEST SEQUENCE

*1. Precondition, LA-4

2. Soak 12 to 20 hours

3. FTP - 3 bags for gaseous emissions

**4. Soak 1.25 to 1.5 hours hood closed

**5. Precondition first 505 seconds of LA-4

6. Idle 1 minute (± 15 seconds)
    (a) auto trans - drive
    (b) start additional cooling fan
    (c) Place filter holder in tunnel

7. SET - 1 bag gaseous emissions
    1 filter sample

8. Engine off - 5 minutes

9. HFET - 1 bag gaseous emissions

---

* If necessary, drain fuel tank of distance accumulation fuel and refill with emissions test fuel.

**Steps 4 and 5 were omitted during optimization testing, but were included for baseline and final configuration test.

of three hardware configurations: (1) stock; (2) maximum air to oxidation catalyst; and (3) all or part of the air modulation system. The last hardware category included tests with and without exhaust manifold air injection.

A. Tests in Stock Configuration

Following receipt of the car from the dealer, a complete series of emission tests (FTP, CFDS and HFET) were performed on the car in the condition received. Several times during optimization of the modulated air system, the vehicle was returned to stock condition and an FTP performed to obtain stock condition emissions. The results of all stock condition FTP tests performed during optimization are shown in Table 25. Also shown in the table are the certification values for the 1978 Volvo 244D with B21F engine.

The as-received CO emissions were more than twice the certification value, while the as-received NO_x emissions were lower. The fact that the CO was higher and NO_x lower than certification values was taken as indicating that the engine was controlled to a richer A/F ratio than the certification ratio. The FTP fuel economy was also lower than the certification level, supporting the assumption that the engine was set richer. It was decided to leave the A/F ratio setting as received to take advantage of the extremely low NO_x levels obtained with this setting. The oxidation catalyst to be installed behind the threeway catalyst would then be depended on to provide sufficient CO control to meet the project CO goal. For the next four months during the optimization procedure, there were indications that the oxidation catalyst with modulated air injection would not be sufficient to meet the project goals with high CO emissions in stock condition. There were also intermittent indications of fuel system malfunction characterized by sudden, unexplainably, large increases in CO. An attempt on September 29, 1978, to obtain the certification emission levels by leaning the A/F ratio did result in CO emissions somewhat below the certification value. However, the NO_x emissions increased to well above the certification level, as shown in Table 25.

It was not until after a significant number of fuel system components had been replaced by representatives of Volvo of America in January, 1979, that good agreement was obtained between the stock FTP emissions and the certification values. See the January 16, 1979, test results in Table 25. The stock configuration tests performed in March, 1979, at the end of the optimization procedure, also were in good agreement with the certification values.

B. Tests With Maximum Air

The stock emission control system on the Volvo was converted to a threeway plus oxidation catalyst system, as described in Section IV-1, following the as-received emission tests. Currently, the normal operating method for threeway plus oxidation catalyst systems is to provide the full output of the air pump to the oxidation catalyst at all times after the first minute or so of a cold start. It is this large amount of often unneeded air that contributes to the high sulfate emissions of such systems. A threeway plus oxidation catalyst with maximum air injection thus served as a baseline system for reductions in sulfate emissions using the air modulation system.

TABLE 25. TEST RESULTS FROM 1978 "CALIFORNIA" VOLVO IN STOCK CONFIGURATION

Date	Gaseous Emissions, g/km (g/mile)			H_2SO_4 mg/km (mg/mi)	ℓ/100 km (mpg)
	HC	CO	NO_x		
		FTP Tests			
7/27/78	0.24(0.39)	3.94(6.34)	0.02(0.03)		14.09(16.70)
7/28/78	0.33(0.52)	5.19(8.34)	0.01(0.02)		14.25(16.51)
9/20/78	0.17(0.27)	4.13(6.64)	0.06(0.09)		12.49(18.33)
9/29/78	0.02(0.03)	1.23(1.98)	0.37(0.60)		11.07(21.25)
1/16/79	0.18(0.30)	2.48(3.99)	0.09(0.14)		12.23(19.23)
3/19/79	0.12(0.20)	2.61(4.21)	0.07(0.12)		12.32(19.09)
3/20/79	0.15(0.25)	2.25(3.62)	0.05(0.08)		12.27(19.17)
9/28/79	0.17(0.27)	2.59(4.16)	0.36(0.58)		11.55(20.37)
Cert. Value	(0.2)	(3)	(0.1)		(20)
		CFDS Tests			
7/27/78	0.14(0.22)	2.56(4.12)	0.01(0.02)	0.11(0.18)	11.10(21.19)
9/20/78	0.10(0.17)	2.43(3.91)	0.07(0.11)	0.16(0.26)	10.34(22.75)
		HFET Tests			
7/27/78	0.11(0.18)	2.12(3.42)	0.01(0.01)		9.45(24.65)
9/20/78	0.10(0.16)	2.37(3.82)	0.05(0.08)		9.45(24.67)
Cert. value					(25)

The first test of the threeway plus oxidation catalyst system with maximum air was run on August 29, 1978. The purpose of this test was to insure that project gaseous emission goals could be met with maximum air injected into the catalyst. Obviously, if the goals could not be met with maximum air, there would be no point in trying to meet the emission goals with less air.

As can be seen from Table 26, replicate tests performed on August 29 and 30, 1978, demonstrated that the project gaseous emission goals for HC and NO_x could be met. However, CO emissions were slightly higher than goal. CFDS tests for sulfates were not run because the catalyst was new and still storing sulfates.

Despite the somewhat high CO emissions, catalyst and emission control system seasoning for 4800 km (3000 miles) was begun. Maximum air injection to the oxidation catalyst was used during the distance accumulation to completely season the catalyst at high oxygen levels.

On September 19, 1979, after completing 4800 km of durability driving, a complete series of tests was run with maximum air to the catalyst. The test results are presented in Table 26. The purpose of this test was to determine sulfate emissions from the car with the addition of an air injected oxidation catalyst. Note that sulfate emissions from the CFDS in this configuration are approximately 130 times higher than the CFDS sulfate emissions from the stock configuration shown in Table 25. These results once again demonstrate the high sulfate levels that can result from threeway plus oxidation catalyst systems. The FTP CO level from this test, while below the 1981 standard, was still higher than the project low service goal.

Following this test, A/F ratio was set leaner and the air modulation system activated. After an additional 800 km of durability driving, a complete test series was run on October 10, 1978. The October 10, 1978, test series was planned as a test of the air modulation system. However, examination of the raw exhaust emission traces and visual inspection of the air modulation system indicated that the air modulation components were not functioning, so that oxidation catalyst received maximum air. Thus, this test was used as another baseline test with maximum air.

The test results are shown in Table 26. The gaseous emissions reflect a leaner A/F ratio with lower CO than the previous test and higher NO_x, (because A/F ratio is further away from optimum NO_x reduction). The CFDS sulfate emissions of 74.9 mg/km (120.5 mg/mile) were almost 4 times higher than the previous test. This level is not unusual for threeway plus oxidation catalyst system.(5,7) The sulfate increase was probably the result of increased sulfate storage from the additional distance accumulation and leaner A/F ratio. This test series was used as the final maximum air baseline during the optimization testing.

The system was not operated with maximum air injection again until after the conclusion of distance durability testing. The results from the maximum air test at 65200 km (40,500 miles) are also shown in Table 27. The FTP gaseous emissions were still below the 1981 standards. The CFDS sulfate emissions decreased to 7.8 mg/km (12.5 mg/mile). This decrease with distance

TABLE 26. TEST RESULTS FROM 1978 "CALIFORNIA" VOLVO WITH THREEWAY CATALYST PLUS AIR INJECTED OXIDATION CATALYST

Date	Test Type	Gaseous Emissions, g/km (g/mile)			H_2SO_4 mg/km (mg/mi)	ℓ/100 km (mpg)
		HC	CO	NO_x		
8/29/78	FTP	0.16(0.26)	1.48(2.39)	0.16(0.26)		12.30(19.21)
8/30/78	FTP	0.16(0.26)	1.38(2.22)	0.15(0.25)		12.15(19.35)
9/19/78	FTP	0.01(0.17)	1.74(2.80)	0.10(0.17)		12.37(19.01)
10/10/78	FTP	0.04(0.06)	1.39(2.24)	0.29(0.47)		11.45(20.54)
9/24/79	FTP	0.18(0.29)	1.52(2.45)	0.36(0.58)		11.64(20.21)
9/19/78	CFDS	0.04(0.06)	0.07(0.11)	0.13(0.21)	20.55(33.06)	9.98(23.58)
10/10/78	CFDS	0.00(0.00)	0.01(0.02)	0.16(0.26)	74.89(120.50)	9.32(25.23)
9/24/79	CFDS	0.04(0.07)	0.17(0.28)	0.35(0.56)	7.79(12.53)	9.74(24.16)
9/19/78	HFET	0.04(0.07)	0.05(0.08)	0.19(0.30)		9.18(25.63)
10/10/78	HFET	0.01(0.02)	0.01(0.01)	0.20(0.32)		9.11(25.82)
9/24/79	HFET	0.02(0.03)	0.06(0.10)	0.41(0.67)		8.88(26.49)

TABLE 27. MASS EMISSIONS FROM COLD START TRANSIENT PHASE OF FTP FOR SELECTED TESTS ON 1978 VOLVO

		First Bag Emissions (grams)		% Change with Manifold Air	
Date	Configuration	HC	CO	HC	CO
9/20/78	Stock	2.46	54.47	--	--
9/21/78	Stock + manifold air	2.46	63.90	0	+17.3
3/1 & 3/5/79 average	Ox. Cat. + open loop + MODAIR	3.56	34.33	--	--
3/6/79	Ox. Cat. + open loop + MODAIR + manifold air	2.32	30.51	-34.8	-11.1
9/28/79	Stock	3.00	43.94		
9/26/79	Stock + aspirated manifold air	3.12	41.62	+ 4.0	-5.3

accumulation is characteristic of sulfate emissions.(7,28,29)

C. Tests with Exhaust Manifold Air Injection

One possible way to reduce emissions is to inject air directly into the exhaust manifold while the catalyst is warming up to operating temperature during a cold start. Several times during the optimization testing of the Volvo, an evaluation of the effectiveness of cold start exhaust manifold air injection was attempted. However, because of the previously explained numerous problems encountered during optimization, only three sets of comparisons were useable.

The first comparison was performed on September 20 and 21, 1978. The first test was in stock condition. The second test was run with the air pump discharging into the exhaust manifold during the first 60 seconds of the cold start, then dumping to atmosphere. The remainder of the emission control system was in stock condition. Since the cold start air injection affects only the cold start transient phase (first bag) of the FTP, its effectiveness should be evaluated by examination of first bag emissions.

Table 27 presents HC and CO emissions in grams for the first bag of the FTP test, together with the percent change in emissions with manifold air injection. As can be seen from the table, the manifold air injection test on September 21 had higher CO emissions than the test without manifold air injection on September 20. The reason for this increase is not known. One possible explanation is that there was too much air injected, so that the additional air quickly cooled the exhaust below the temperature required to convert CO to CO_2.

The next comparison check of manifold air injection was performed in March, 1979. The purpose of this comparison was to determine if manifold air injection would help the modulated air system developed for this project. In this case, the emission control configuration consisted of the oxidation catalyst with modulated air injection and an open loop A/F ratio control circuit for cold starts. (See Figures 25 and 30).

This configuration was tested on March 1 and 5, 1979. The average first bag HC and CO emissions from these tests are shown in Table 27. The manifold air injection was then installed and tested on March 6, 1979. The first bag HC and CO mass emissions from this test are also shown in Table 27. Note that CO is approximately 11 percent lower with the manifold air injection. The modulated air system continusouly dumped a portion of the air pump discharge. Thus, only part of air pump discharge was available for manifold injection.

The last investigation of exhaust manifold air injection was performed following the durability testing. For this investigation, a reed valve aspiration system, similar to Canadian Volvo model, was used. It is compared to the stock condition test run at the completion of durability testing in Table 27. In this case, there was a 5.3 percent reduction in CO emissions with the cold start exhaust manifold air injection. While no detailed investigation of air injection rates was conducted from the three sets of tests presented here, it appears that there may be an optimum air injection rate, with higher CO emissions from air injection rates either higher or lower than optimum.

D. Tests to Optimize the Air Modulation System

Over twenty tests were run with various parts of the air modulation system installed on the Volvo. However, many of them were performed to investigate the apparent fuel system problem or merely to adjust the A/F ratio in steps to obtain the best A/F ratio for use with the air modulation system. Of these many tests, seven tests are presented in Table 28 to show the evolution of the final modulated air injection system.

Prior to beginning the optimization of the air modulation system, 4830 km (3000 miles) of durability driving was accumulated. The complete air modulation system was installed and functioning during the distance accumulation, except for the threeway vacuum solenoid and air pump centrifugal clutch. However, the air modulation valve was bypassed so that the oxidation catalyst received the full air pump discharge.

The air modulation system was completed in early October 1978, with the installation of the air pump centrifugal clutch. The idle CO was adjusted richer, from 0.6 percent to 1.4 percent (with the oxygen sensor disconnected). An FTP test was run on October 5, 1978, to check the system operation. The results of the test are shown in Table 28. The HC emissions met the target low mileage emission goal, but the CO and NO_x did not. However, the emissions results were encouraging,considering no system optimization had been done.

While checking the setting of the air modulation valve prior to the October 5 test, it was found that the idle vacuum was only 10 inches of mercury (gauge pressure). This was considerably below the usual 16 to 18 inches of mercury seen on carbureted cars of U.S. manufacture. The investigation as to whether or not this vacuum level was correct delayed the optimization testing almost two months.

While in the process of checking the vacuum level with the manufacturer, continuous CO traces from the first few tests were analyzed. When setting up the air modulation schedule for the air modulation valve, it was assumed that there would be CO excursions during accelerations, as there were with the two carbureted engines on which the system was previously used. The CO traces from the Volvo showed, however, that the Lambda-Sond system handled accelerations well and that most of the CO spikes were during decelerations. The air modulation valve required some modification to provide air during decelerations rather than accelerations. In addition, the traces indicated that changes to the air flow schedule were required. The final air injection versus manifold vacuum curve for the valve is shown in Figure 31. By the end of November, 1978, the idle vacuum had finally been determined to be correct. The air modulation system was now ready for additional testing on the car.

During the FTP tests run on December 1, 1978, continuous CO values increased two to five times after about 280 seconds into the test. A repeat test on December 4 showed the same high CO values throughout the tests. Checks of the idle CO and oxygen sensor did not reveal any abnormalities.

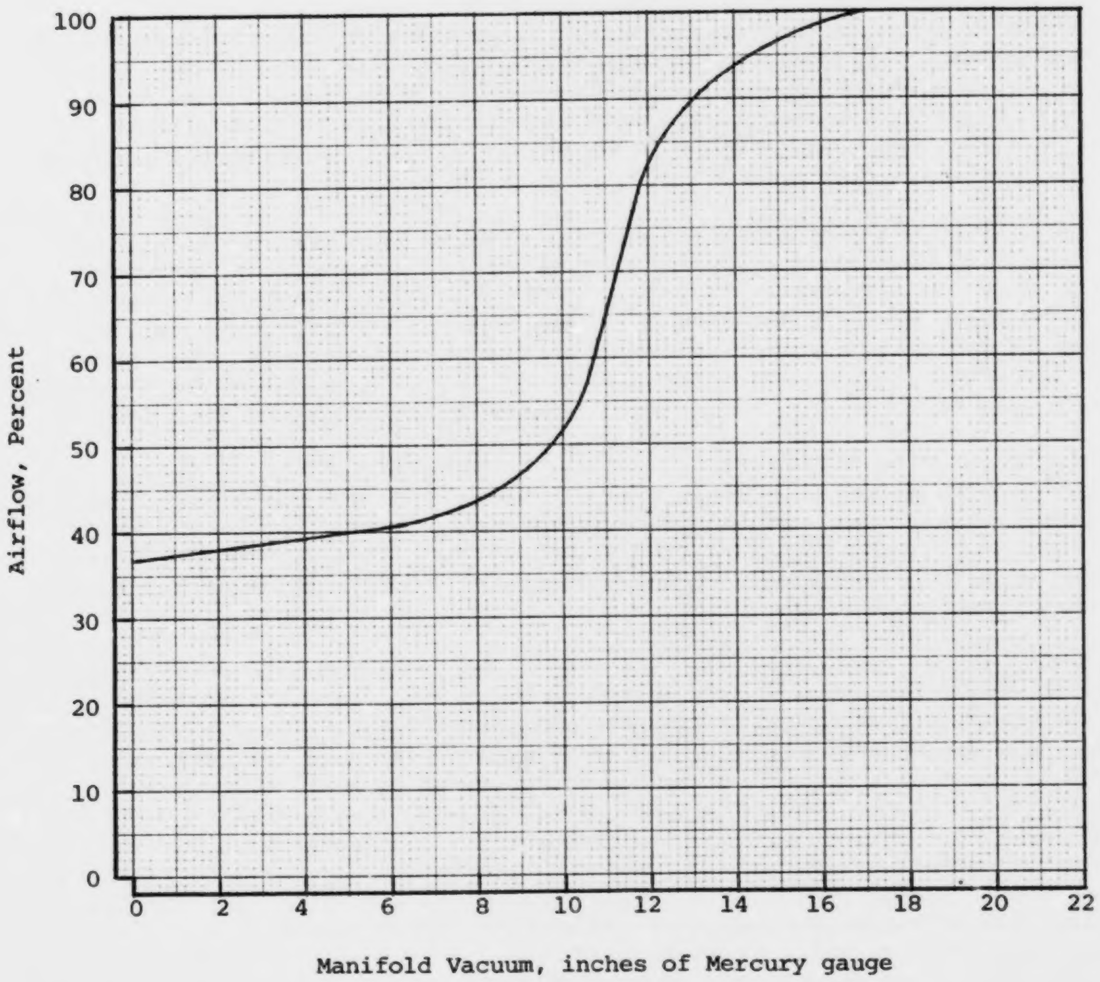


Figure 31. Air modulation valve air flow calibration on 1978 Volvo

Another delay in the optimization testing was then encountered, while the help of Volvo of America was sought and received. In January 1979, under the direction of personnel from Volvo of America, the fuel distributor and all four fuel injectors were replaced in the course of correcting the high CO problem. This apparently corrected a problem in the fuel system that had existed since the car was received from the dealer.

Optimization testing resumed in late January, 1979. Tests run in early December, 1978, had indicated that the air pump was supplying too much air to the oxidation catalyst, resulting in higher than desired sulfate levels. By utilizing the fact that the static pressure of the flowing exhaust gases is normally lower than atmospheric pressure, ambient air can be drawn into the exhaust pipe, in a manner similar to an eductor without using the air pump.

A number of tests were run in this configuration with progressively leaner A/F ratios. The best overall gaseous emission results were from the test on February 5, 1979, as shown in Table 28. The HC and NO_x emissions from this test met the project goals, but CO was still above the project goal.

Following this test, CO emissions were examined on a bag-by-bag basis. Approximately 90 percent of the composite CO level was from the first bag. From the raw exhaust CO traces, it was determined that the majority of the first bag CO came from approximately the first minute of operation.

To reduce the CO emissions during the cold start, the open loop fuel control circuit described in Section IV-1 was installed on the car.

The first test of this system was on February 7, 1979. The test results are shown in Table 28. The first bag CO for this test was 32.5 grams, compared with 42.0 grams for the first bag of the previous test on February 5. This was a reduction of 23 percent in the first bag.

The open loop system had proven effective. However, the CO emissions were still not within the project goals for 6500 km. An examination of the raw exhaust oxygen trace indicated that the CO emissions would benefit from slightly more oxygen. Therefore, the air pump was reconnected to the air injection system, but with a large portion of the air pump discharge dumped to the atmosphere. However, the cold start manifold air injection was not connected. A test was run in this configuration on February 12, 1979. The composite CO from this test was 1.23 g/km. As can be seen in Table 28, HC and NO_x were below the project goals. This was the lowest CO level achieved during the optimization testing.

In an effort to further reduce first bag CO levels, cold start air injection to the exhaust manifolds was reconnected. Tests run with this system did not give the expected results. After considerable investigation, the problem was found to be a leak in the diverter valve allowing air to be injected into the exhaust manifold. A manually operated shutoff valve was installed in the manifold air injection line to stop air leakage into the exhaust manifold.

TABLE 28. FTP TEST RESULTS FROM 1978 "CALIFORNIA" VOLVO

Date	Configuration	Gaseous Emissions, g/km (g/mile)			Fuel
		HC	CO	NO_x	ℓ/100 km (mpg)
10/5/78	3-way + ox. + MODAIR	0.07(0.11)	1.16(1.87)	0.47(0.75)	10.72(21.94)
12/1/78	3-way + ox. + MODAIR	0.14(0.23)	1.79(2.88)	0.21(0.34)	11.26(20.88)
2/5/79	3-way + ox. + amb. MODAIR[a]	0.10(0.16)	1.69(2.72)	0.15(0.25)	11.72(20.08)
2/7/79	3-way + ox. + amb. MODAIR + open loop	0.11(0.18)	1.36(2.19)	0.13(0.20)	11.81(19.91)
2/12/79	3-way + ox. + MODAIR + open loop	0.10(0.16)	1.23(1.98)	0.12(0.19)	11.08(21.23)
3/6/79	3-way + ox. + MODAIR + open loop + manifold air	0.11(0.18)	1.31(2.10)	0.15(0.24)	11.72(20.08)
3/12/79	3-way + ox. + MODAIR + open loop + manifold air	0.14(0.23)	1.31(2.10)	0.13(0.23)	11.61(20.26)

---

[a] amb. MODAIR refers to modulated air injection from ambient air (no air pump).

An FTP test was run on March 6, 1979, with air to the exhaust manifold during the first 56 seconds of the cold start. There was a reduction in the first bag CO of approximately 10 percent. The first bag CO was reduced from an average of 34.3 grams for the two previous tests without manifold injection to 30.5 grams with manifold injection.

Examination of the CO traces taken during February and March seemed to indicate some sort of intermittent fuel system malfunction. Further testing was postponed while the fuel system was throughly cleaned and a new fuel filter installed. A test on March 12, 1979, produced results similar to the March 6 test. (See Table 28).

After discussing these results with the EPA, it was decided that the system was as close to the project goals as possible without expending unreasonable additional effort, and that the durability testing should begin. Thus, the test on March 12, 1979, closes the optimization phase of the project. The predurability emission goals were met for HC, NO_x and sulfate. The CO emission level was approximately 0.25 g/km higher than the goal of 1.06 g/km.

The final emission control system consisted of the stock Lambda-Sond system, plus the items listed below:

- a monolithic oxidation catalyst after the threeway catalyst
- a modulated air injection system to the oxidation catalyst
- cold start air injection to the exhaust manifolds
- a separate open loop fuel control for cold starts.

It should be pointed out that while the FTP gaseous emissions from the oxidation catalyst with modulated air system can be compared with the stock system to determine improvements resulting from the new system, the sulfate emissions should not be compared to the stock system.

It is well documented that threeway catalyst systems have low sulfate emissions. However, when an air injected oxidation catalyst is added behind the threeway system, tailpipe sulfate emissions can be quite high. Therefore, sulfate emissions from the air modulation system should be compared with tests on the air injected oxidation catalyst system without air modulation. These tests were run on the Volvo on September 19, 1978, and October 10, 1978. A comparison of the CFDS sulfate emissions for the stock system and air injected system oxidation catalyst system with and without air modulation is shown in Table 29. Since a number of changes were made in the fuel system of the car between October 1978, and March 1979, the FTP gaseous emissions for the two emission control system configurations are not comparable.

TABEL 29. COMPARISON OF EMISSIONS ON 1978 VOLVO WITH THREE EMISSION CONTROL SYSTEM CONFIGURATIONS

Date	Test Type	Configuration	Gaseous Emissions, g/km[a]			H_2SO_4 mg/km	Fuel ℓ/100 km
			HC	CO	NO_x		
9/20/78	FTP	Stock	0.17(0.27)	4.13(6.64)	0.06(0.09)	----------	12.49(18.83)
9/19/78	FTP	Stock + ox. cat. + Air[b]	0.10(0.17)	1.74(2.80)	0.10(1.17)	----------	12.37(19.01)
10/10/78	FTP	Stock + ox. cat. + Air	0.04(0.06)	1.39(2.24)	0.29(0.47)	----------	11.45(20.54)
3/16/79	FTP	Stock + ox. cat. + MODAIR[c]	0.10(0.15)	1.25(2.24)	0.13(0.22)	----------	12.18(19.32)
9/20/78	CFDS	Stock	0.10(0.17)	2.43(3.91)	0.07(0.11)	0.16(0.26)	10.34(22.75)
9/19/78	CFDS	Stock + ox. cat. + Air	0.04(0.06)	0.07(0.11)	0.13(0.21)	20.55(33.06)	9.98(23.58)
10/10/78	CFDS	Stock + ox. cat. + Air	<0.01(<0.02)	0.01(0.02)	0.16(0.26)	74.89(120.50)	9.32(25.23)
3/16/79	CFDS	Stock + ox. cat. + MODAIR	<0.01(<0.02)	0.66(1.06)	0.08(0.14)	0.04(0.06)	9.75(24.13)

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[a] Numbers in parentheses are g/mile (mg/mile for H_2SO_4) except for fuel which is miles/gallons

[b] Lambda-Sond system with oxidation catalyst with air pump

[c] Lambda-Sond system with oxidation catalyst and modulated air from air pump

IV-3. DURABILITY TESTING OF 1978 VOLVO

With the gaseous emissions from air modulation system installed on the Volvo at a satisfactory level, the durability demonstration was begun. For distance accumulation, the car was driven on the road course shown in Figure 4, Section II. The distance accumulation procedure as explained in Section II was used. Emission tests were performed every 8050 km (50000 miles).

A. Distance Accumulation Chronology

Distance was being accumulated on the car throughout the optimization phase. With the exception of the open loop fuel control circuit and the solenoid shutoff valve in the manifold air injection line, all emission control hardware had been installed on the car at approximately 160 km (100 miles). Thus, the air modulation system hardware had accumulated as much service as the other systems on the car. The idea was to produce an optimized system at 8050 km, with emissions at a level that would allow for some further deterioration. This was to avoid being misled by low emissions from an unseasoned catalyst which would increase rapidly for the first few thousand kilometers as the catalyst aged. Since the car had accumulated approximately 8050 km (5000 miles) during optimization testing, it was driven for only 320 km (200 miles) on the durability driving schedule to stabilize the sulfate emissions prior to the 8050 km test series.

Following the 8050 km tests, the car was returned to stock condition and tested twice on the FTP cycle to obtain a 8050 km stock baseline. The air modulation system was reconnected and distance accumulation on a continuous basis begun on March 25, 1979.

A graphical representation of the distance accumulation records is presented in Figure 32, which shows daily distance, maintenance, and emission test points. This figure can be referred to as necessary for clarification of the order of events.

Scheduled maintenance was performed every 12,070 km (7500 miles) as specified in the Volvo service manual. A summary of the required maintenance is shown in Table 30. Unscheduled maintenance was performed as required. Unscheduled maintenance is also shown on Figure 32.

Distance accumulation continued until September 14, 1978, when 64,400 km (40,000miles) of service had been accumulated. At that time, distance accumulation was halted due to funding limitations.

Following the 64,400 km durability test, the air modulation system was bypassed so that all of the air pump discharge went directly to the oxidation

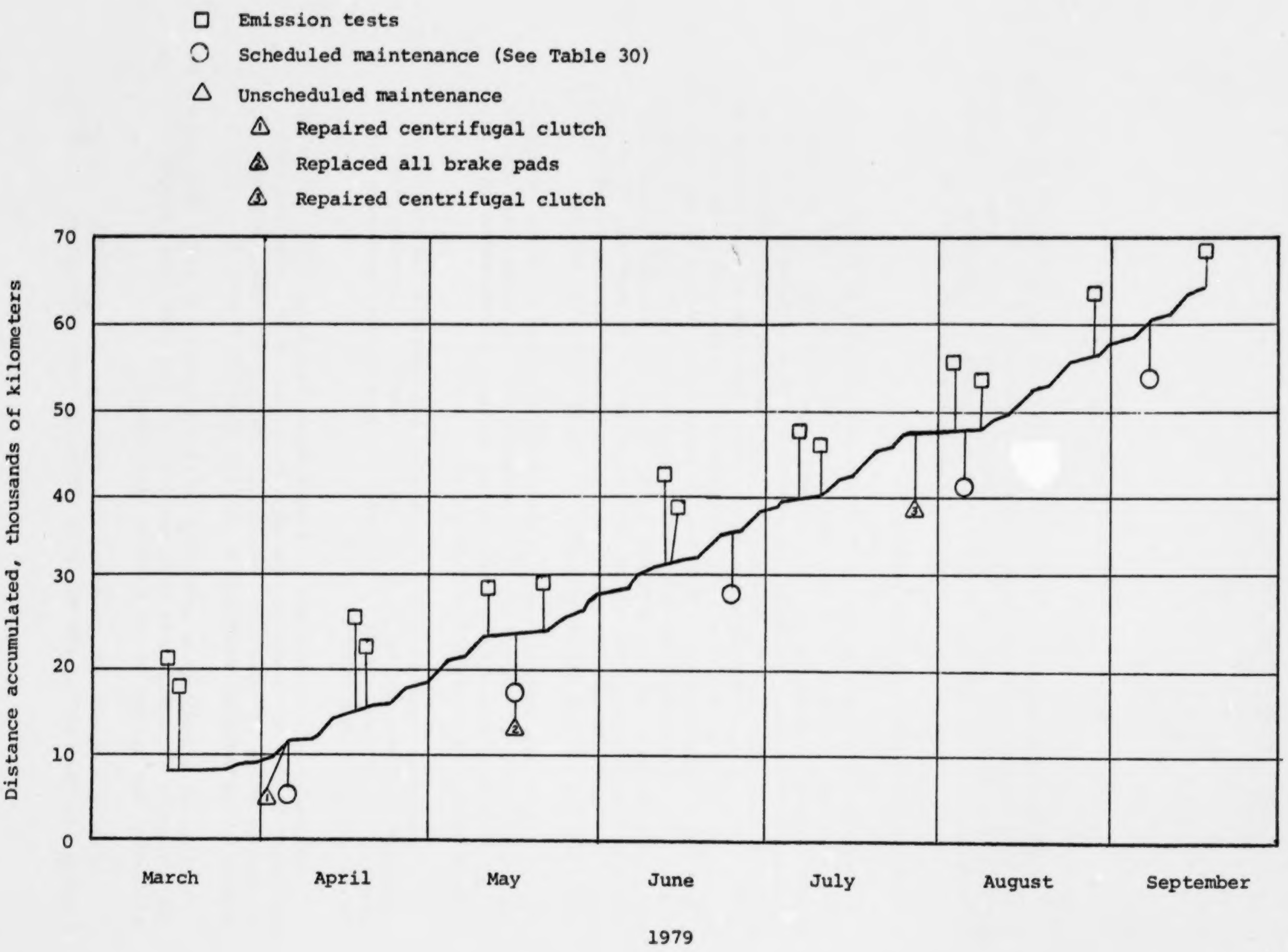

Figure 32. Distance accumulation record of 1978 Volvo 244DL.

TABLE 30. VOLVO MAINTENANCE SCHEDULE

7,500	15,000	30,000	45,000	Op. No.	
					In drivers Seat
x				1	Check Brake Vacuum Booster Function.
x				2	Check Brake Pedal operation for Leakage in System.
x				3	Check and adjust Parking Brake.
x				4	Check operation of Instrument Panel Indicator Lights.
x				5	Check Automatic Transmission Gear Selector.
x				6	Check Seat Belt and Warning Light and Buzzer.
					Exterior
x				7-10	Lubricate Door, Hood and Trunk, Hinges, Latches and Locks.
		x		11	Check Gas Cap Seal.
					On Lift
x				12	Check Steering gear Function.
x				13	Check Front End Suspension for Wear.
x				14	Check Front Wheel bearings.
x				15	Check Control arm Bushing and Strut Attachment.
x				16	Check Steering Rod play.
x				17	Check Steering Rack for Axial play.
x				18	Check Front Wheel balance.
x				19	Check Front Wheel bearings for noise.
x				20	Check Front Tire wear pattern.
x				21	Check Steering Rack Rubber Bellows.
x				22	Check Steering Rack Attachment.
x				23	Check Front Ball Joints.
x				24	Check Steering Rod ends.
x				25	Check Front Control Arm Bushings.
x				26	Check Stabilizer Bar Bushings.
x				27	Check Front Shock Absorbers.
x				28	Check Front Spring Attachment.
x				29	Check Brake Hoses.
	x			30	Check Front Wheel Brakes.
x				31	Check Clutch play.
x				32	Check Transmission for leaks.
		x		33	Change Manual Transmission oil.
x				34	Adjust Automatic Transmission Gear Selector.
x				35	Check Brake and Fuel Lines.
x				36	Check Drive Shaft Bolts and Joints.
	x			37	Check Catalytic Converter Mounting Bolts.
x				38	Check Exhaust System.
x				39	Check Rubber Bellows on Parking Brake Cables.
x				40	Check Rear Axle oil level.
x				41	Check rear Shock Absorbers.
x				42	Check Rear Suspension
x				43	Check Rear Tire Wear.
	x			44	Clean Fuel Tank Filter.
x				45	Check for Engine Leaks.
x				46	Drain Engine Oil.
x				47	Change Engine Oil Filter.
	x			48.	Check Rear Wheel Brakes.

7,500	15,000	30,000	45,000		
					Under Hood
x				49	Fill Engine oil.
x				50	Check Brake Reservoir Level.
x				51	Check Clutch Reservoir Level (260 only)
x				52	Check Steering gear for leaks.
		x		53	Change coolant.
x				54	Check Engine Coolant Freezing point.
	x			55	Check Cooling System - Pressure Test.
x				56	Check Battery Level, Terminals and Mounting.
x				57	Check and adjust Engine Throttle Cable.
		x		58	Change Air Filter.
		x		59	Change Fuel Filter (CI System).
			x	60	Change Chargoal Canister.
x				61	Check and adjust Engine Drive Belts.
	x			62	Inspect and Clean, PCV valve.
x				63	Check Torque of Manifold Bolts (B20, only).
	x			64	Replace Spark Plugs.
	x			65	Adjust Timing Gear Belt (B21 only).
			x	66	Change Timing Gear Belt (240 only).
	x			67	Adjust Valves (B21).
	x			68-70	Adjust Valves (B27).
x				71	Adjust Valve Clearance (B20 only)
	x			72	Clean E.G.R. Valve.
		x		73	Change E.G.R. Valve.
	x			74	Reset E.G.R. Reminder Light.
	x			75-76	Check Throttle Switch - Adjust.
	x			77-78	Lubricate Distributor.
	x			79	Connect Engine Test Instrument.
	x			80	Check Battery Test Voltage.
	x			81	Check Battery Starting Voltage.
	x			82	Check and Install Distributor Cap.
	x			83-84	Check and Adjust Timing.
		x		85	Check Distributor Centrifugal Advance.
	x			86	Check vacuum retard.
	x			87	Check Exhaust Gas Recirculation.
	x			88	Adjust Idle.
x				89	Check Automatic Transmission Fluid Level.
		x		90	Check Fuel Lines for Tightness - Underhood.
	x			91	Check Electrical Wires under Hood.
	x			92-93	Check Function of Diverter Valve.
	x			94-116	Check Engine CO and HC Emission.
x				117	Check and Adjust Throttle Wire BW 35.
x				118	Check and Adjust Throttle Wire BW 55.
		x		119	Adjust Reverse Band (BW 35).
x				120	Check Tire Pressure.
x				121	Check and Adjust Headlight Alignment.
					Road Test
x				122	Engine Performance.
x				123	Electrical System - Operation.
x				124	Drive Train - Operation, Noise.
x				125	Brakes - Performance.
x				126	Steering and Handling - Performance.
x				127	Suspension - Noise.
x				128	Body - Noise, Leakage

catalyst after the first 56 seconds of the cold start. During this time, the air pump discharge was routed to the exhaust manifold. The car was driven for 500 miles on the durability driving course to season the catalyst. A full test series (FTP, SET, HFET) followed the distance accumulation to obtain gaseous emissions and sulfate using the full air pump capacity. The purpose of this test was to obtain a 64,400 km baseline CFDS test for sulfate emissions.

For a final comparison test, the car was returned to stock condition and an FTP test run. This test was the 64,400 km stock condition baseline for comparison of FTP gaseous emissions.

B. Fuel and Oil Consumption

Unleaded gasoline meeting the requirements of 40 CFR, paragraph 86.113-79 was used for distance accumulation. The fuel was designated within SwRI as EM-344-F. An analysis of the fuel is given in Table 1, Section II. Shell 20W-50 motor oil was used throughout the distance accumulation. Fuel and oil consumption between emission tests is listed in Table 31. Fuel consumption is consistent but somewhat below the level expected in the intervals between emission tests. Since only two quarts of oil were added during the entire 64,400 km (40,000 miles) of distance accumulation, the oil consumption appears erratic. In general, it can be said that the car used less than a quart of oil between oil changes (12,070 km or 7500 miles), with the oil starting at the correct capacity after each oil change.

C. Emission Test Results

The results of all the 8050 km interval emission tests (average of duplicate tests where appropriate) and the 8050 km and 64,400 km stock condition tests are presented in Table 32. The emission results are also presented graphically in Figures 33 and 34. As can be seen from the table and figures, both HC and CO increased steadily over the 64,400 km, while NO_x, after a step increase at 24,135 km (15,000 miles) after maintenance, remained approximately constant. The CFDS sulfate emissions, listed in Table 33 and shown graphically in Figure 34, also remained approximately constant during the 64,400 kilometers.

A linear regression was performed for each emission type as a function of distance. The regression lines and equations are shown in Figures 33 and 34. Extrapolating the HC and NO_x emissions to 80,400 km (50,000 miles) using the regression equations indicated that these emissions would still be within the 1981 Federal standards at that point. A similar extrapolation of the CFDS sulfate emissions indicated that they would be within the project goal at 80,400 km.

Thus, the emission control system appears able to meet the 1981 Federal gaseous emission standards, except for CO, while maintaining low sulfate levels.

TABLE 31. FUEL AND OIL CONSUMPTION DURING DURABILITY TESTING OF 1978 VOLVO

Distance Interval km (miles)	Fuel ℓ/100 km (mpg)	Oil Consumption ℓ/1000 km (qt/1000 mi)
0-8050 (0-5000)	13.44(17.50)	no oil added
8050-16100 (5000-10000)	13.16(17.88)	0.14(0.24)
16100-24150 (10000-15000)	13.23(17.78)	no oil added
24150-32200 (15000-20000)	12.93(18.19)	0.12(0.21)
32200-40250 (20000-25000)	12.87(18.28)	no oil added
40250-48300 (25000-30000)	12.91(18.22)	no oil added
48300-56350 (30000-35000)	12.86(18.30)	no oil added
56350-64400 (35000-40000)	12.59(18.69)	no oil added
Overall	13.00(18.09)	0.03(0.05)

TABLE 32. FTP EMISSIONS FOR 1978 VOLVO 244 WITH AIR MODULATION DURING 64,400 KILOMETER DURABILITY TESTING

Distance Accumulated km(miles)	Emissions g/km (g/mile)			Fuel ℓ/100 km (mpg)
	HC	CO	NO_x	
		8050 stock baseline		
8050(5000)	0.14(0.22)	2.43(3.91)	0.06(0.10)	12.30(19.13)
		Durability Testing of Air Modulation System		
8100(5035)	0.10(0.16)	1.28(2.05)	0.14(0.22)	12.23(19.24)
15,526(9649)	0.09(0.14)	1.38(2.22)	0.14(0.22)	12.30(19.12)
24,154(15,012)	0.12(0.19)	2.09(3.36)	0.09(0.15)	11.90(19.77)
24,212(15,048)[a]	0.12(0.19)	1.27(2.04)	0.38(0.61)	12.37(19.01)
32,000(19,955)	0.14(0.23)	2.00(3.22)	0.32(0.52)	12.44(18.92)
40,280(25,035)	0.19(0.31)	1.66(2.68)	0.41(0.65)	11.97(19.67)
48,157(29,930)	0.17(0.28)	1.77(2.85)	0.41(0.66)	12.13(19.39)
48,238(29,980)[a]	0.18(0.29)	1.71(2.76)	0.43(0.69)	12.11(19.42)
56,262(34,967)	0.19(0.31)	2.45(3.94)	0.37(0.59)	11.87(19.82)
64,370(40,006)	0.16(0.25)	2.27(3.65)	0.34(0.55)	11.50(20.46)
		64,400 km stock baseline		
65,900(41,000)	0.17(0.27)	2.59(4.16)	0.36(0.58)	11.55(20.37)

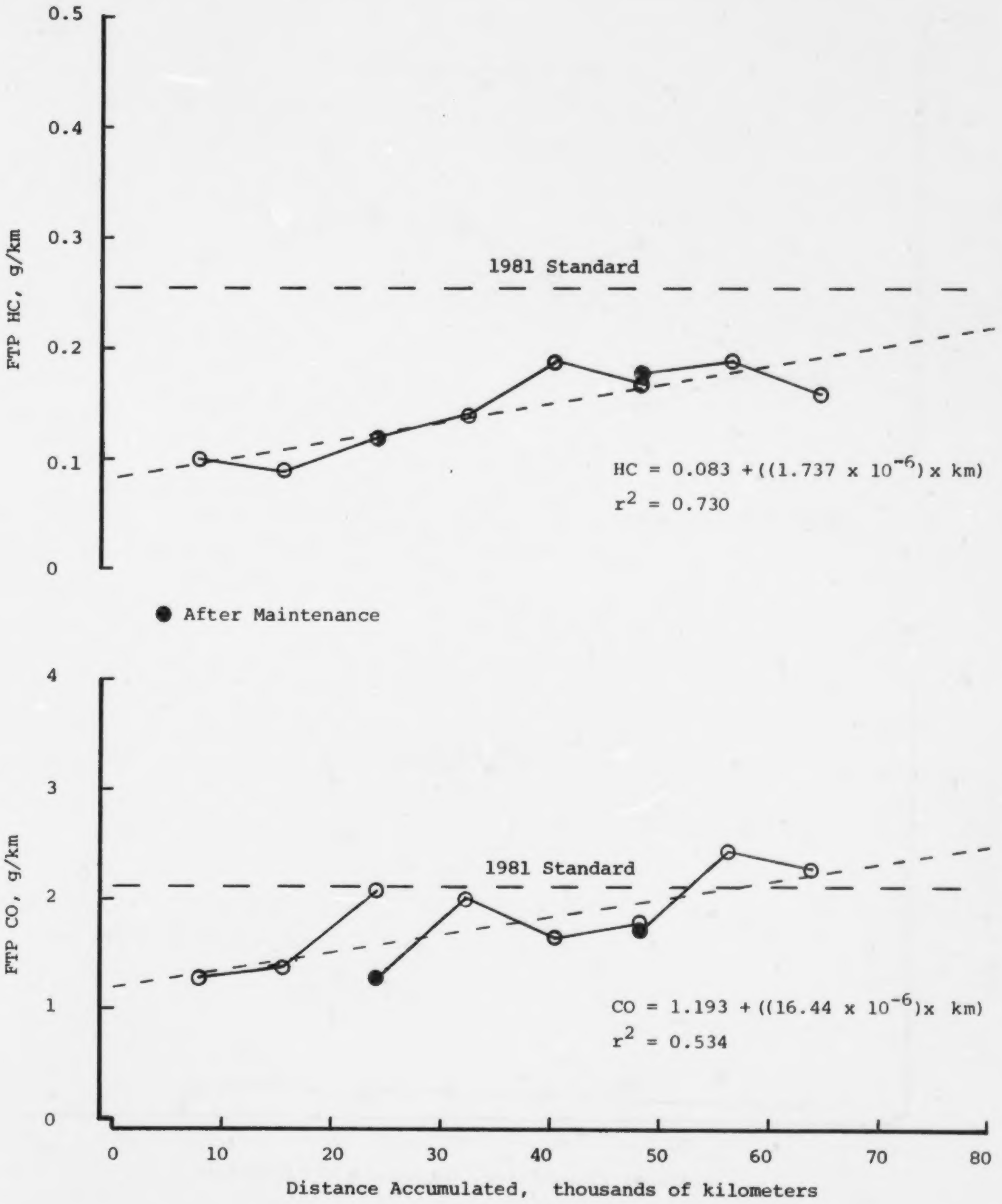

Figure 33. HC and CO emissions from a 1978 Volvo with Lambda-Sond plus oxidation catalyst and modair as a function of distance

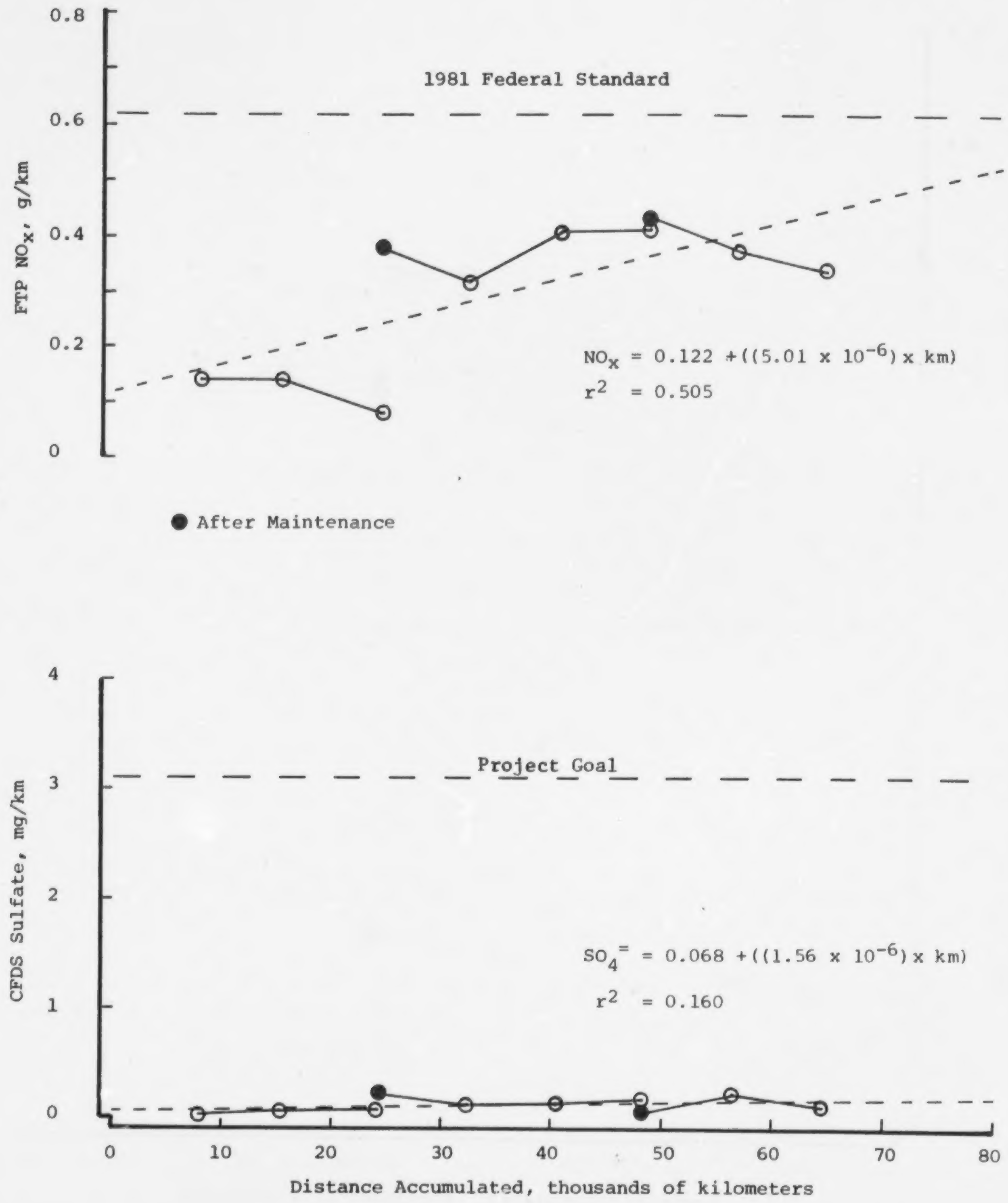

Figure 34. NO_x and sulfate emissions from a 1978 Volvo with Lambda-Sond plus oxidation catalyst and modair as a function of distance

TABLE 33. CFDS SULFATE EMISSIONS FOR 1978 VOLVO 244 WITH AIR MODULATION DURING 64,400 KILOMETRE DURABILITY TESTING

Distance Accumulated km, (miles)	Sulfate mg/km (mg/mile)
Sulfate Baseline	
5,150(3,200)	74.89(120.50)
Durability Testing of Air Modulation System	
8,100(5,035)	0.04(0.06)
15,526(9,649)	0.06(0.10)
24,154(15,012) (a)	0.09(0.14)
24,212(15,048)	0.24(0.39)
32,000(19,955)	0.09(0.14)
40,280(25,035)	0.15(0.24)
48,157(29,930) (b)	0.14(0.23)
48,238(29,980)	0.08(0.13)
56,262(34,967)	0.25(0.41)
64,370(40,600)	0.11(0.18)
64,400 km Sulfate Baseline	
65,164(40,500)	7.79(12.53)

An examination of the stock configuration emissions in Table 32 shows that the additional oxidation catalyst is required only for CO control. The threeway catalyst alone is capable of meeting the 1981 standards for HC and NO_x. If gaseous emissions from the stock condition tests are plotted as a function of distance accumulated, as shown in Figure 35, it can be seen that the CO deterioration rate is much lower for the stock vehicle than for the air modulation system. Thus, the increase in CO over the 64,400 kilometers was almost entirely due to deterioration of the oxidation catalyst/ air modulation system.

The sulfate emission reduction seen in Figure 36 for the maximum air injection tests agreed well with sulfate reduction seen in a previous project using air injected oxidation catalysts.(7)

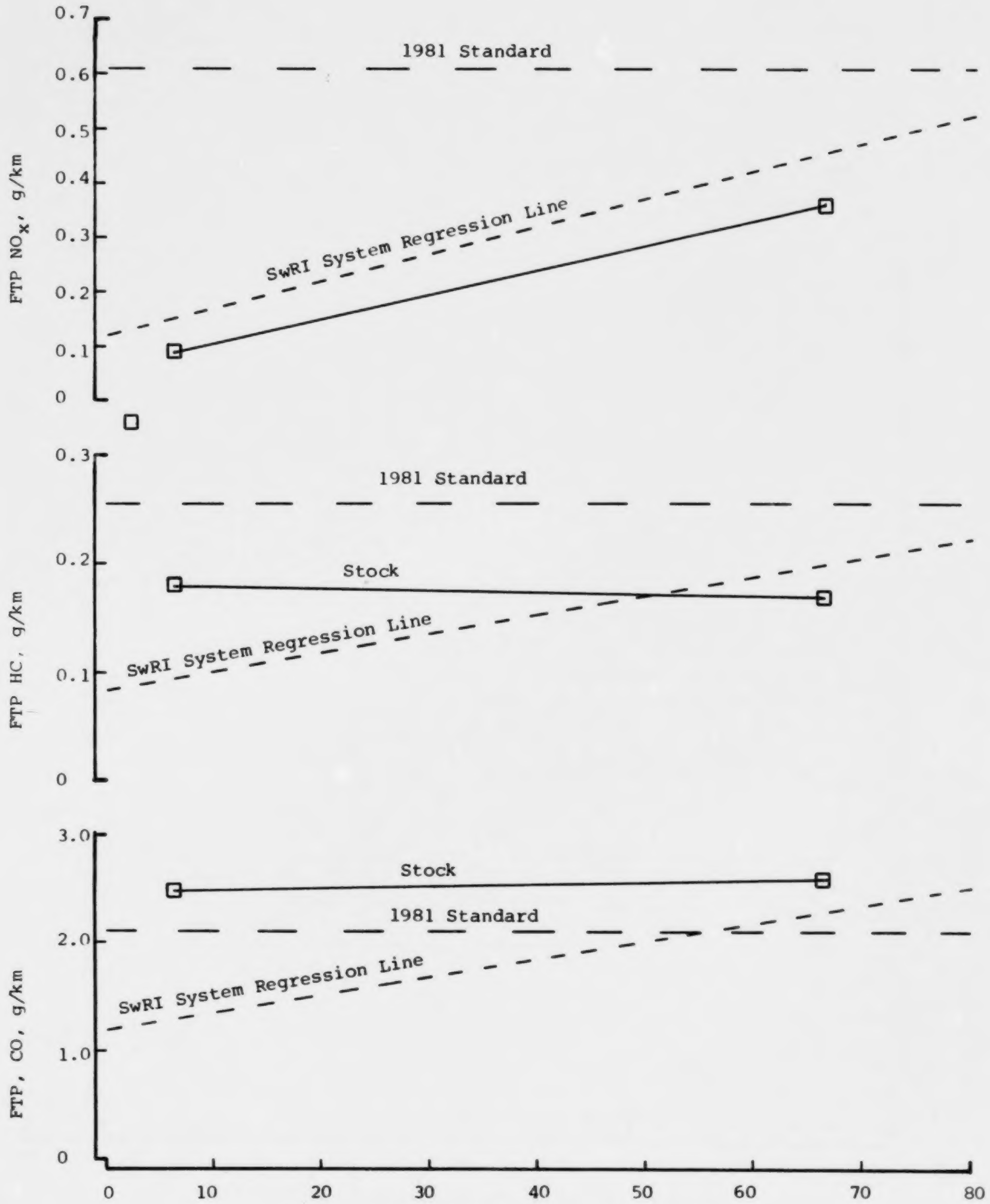

Figure 35. FTP gaseous emissions as a function of distance driven for two emission control systems on a 1978 Volvo

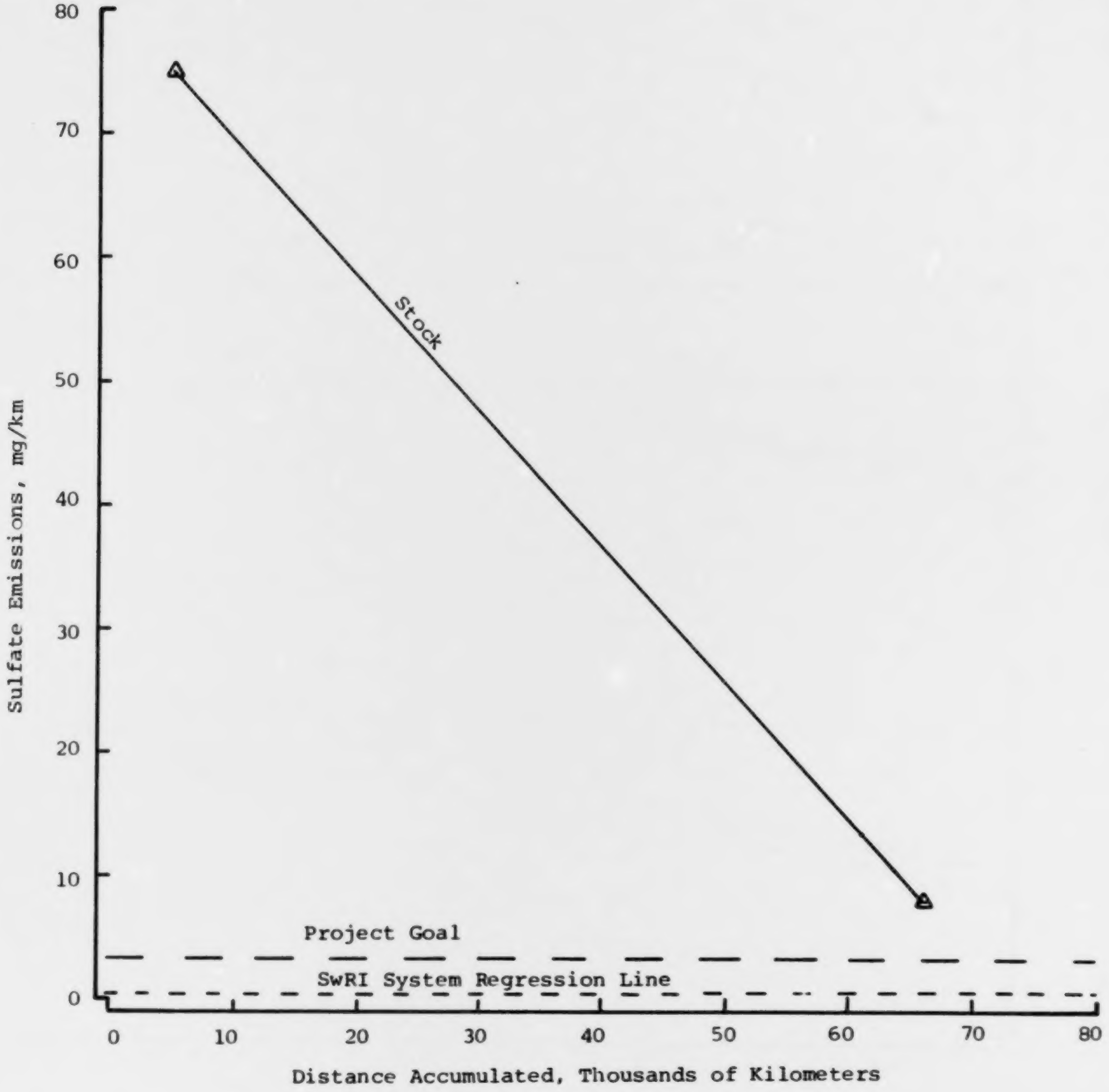

Figure 36. CFDS sulfate emissions as a function of distance driven for two emission control systems on a 1978 Volvo

V. CONCLUSIONS

The objective of this project was to evaluate the low sulfate emission ability of several emission control systems capable of meeting 1981 gaseous emission standards and to test some of these systems for durability. From the work accomplished during this project, a number of conclusions may be derived regarding the effectiveness and durability of the tested emission control system.

A. Ability to Produce Low Sulfate Emissions

For this project, low sulfate emissions were defined as being below 3.1 mg/km (5.0 mg/mi.). Four systems were evaluated: (1) oxidation catalyst with modulated air injection and EGR: (2) high temperature exhaust system with oxidation catalyst; (3) threeway catalyst with feedback carburetor; and (4) threeway plus oxidation catalyst with modulate air injection and feedback fuel injection. From tests of these systems the following conclusions were drawn:

1. Modulating the air injected into an oxidation catalyst can result in low sulfate emissions at the expense of some increase in CO emissions. When compared with standard air injection systems, air modulation reduced sulfates from all three versions of air modulation systems tested. The reductions were 98 percent for the Chevrolet Impala , 62 percent for the Chevrolet Nova, and 99+ percent for the Volvo.

2. Increasing the temperature of exhaust gases reduced sulfate emissions from oxidation catalysts. An increase of 75°C (134°F) in exhaust temperature at the exhaust manifold discharge during the CFDS test reduced sulfate emissions 37 percent with the system tested on a 1975 Chevrolet Nova with 5.74 litre (350 CID) engine.

3. Threeway catalyst systems have low sulfate emissions. However, while the two threeway systems tested could be made to meet either the 1981 CO or 1981 NO_x standard, neither system could meet both standards at the same time.

B. Durability

The sulfate emissions remained within the project goal for all systems during durability testing. However, none of the three systems tested for durability were able to maintain all gaseous emissions within the 1981 standards. Examination of the durability test results produced the following conclusions.

1. It is possible to maintain low sulfate emissions for 80,500 km (50,000 miles) with any of the three systems tested (oxidation catalyst with modulated air injection, threeway catalyst, and threeway plus oxidation catalyst with modulated air injection).
2. The fuel injected, threeway plus oxidation catalyst with modulated air injection proved the most durable, maintaining all emissions within the project goals for 56,350 km (35,000 miles).

C. General

The project demonstrated several means of obtaining low sulfate emissions from emission control systems designed for the 1981 gaseous emission standards. The most promising system tested was a threeway catalyst (5:1, Pt:Rh) plus an oxidation catalyst with modulated air injection which was tested for 64,400 km (40,000 miles). Thus, the project fulfilled its objective of demonstrating the effectiveness and durability of low sulfate emission control systems for 1981 and beyond.

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APPENDIX A

Worksheets for Sulfate Control System Evaluation

Sulfate Control Durability Demonstration
Control System Evaluation Sheet

System Air Modulation

Evaluation Item	Score	Weighting Factor	Weighted Score	Max. Possible Weighted Score
1. Meets gaseous emission goals	5	2.0	10	(20)
2. Sulfate emissions	10	1.5	15	(15)
3. Fuel economy	5	1.5	7.5	(15)
4. Durability	5	1.0	5	(10)
5. Cost	10	1.0	10	(10)
TOTAL SCORE		---	47.5	(70)

Scoring Criteria

Item	
1. Meets gaseous emission goals	(a) If HC, CO, NO_x below 0.25, 2.11 and 0.93 g/km respectively, score = 10. (b) If only one of the gaseous emissions is over the goal and it does not exceed the goal by more than 50%, score = 5. (c) If more than one of the gaseous emissions is over the goal, score = 0.
2. Sulfate emissions	(a) If 3.1 mg/km or less on SET test score = 10. (b) If greater than 6.2 mg/km, score = 0. (c) Between 3.1 and 6.2 mg/km, score = 20 - (3.226 x Sulfate emissions, mg/km)
3. Fuel economy	(a) If fuel economy improved by more than 5% score = 10. (b) If fuel economy ±5%, score = 5. (c) If fuel economy decreased by more than 5%, score = 0.
4. Durability	(a) Estimate life of system without repairs or replacement (only addition parts added for sulfate control - not total system) (b) Score = $\frac{\text{Miles}}{50000} \times 10$
5. Cost	(a) This is a relative evaluation - least cost system score = 10. (b) For other systems: score = $\frac{\text{least cost}}{\text{system cost}} \times 10$

System: Air Modulation

1. Gaseous Emissions (FTP) g/km

	HC	CO	NO_x
Air Modulation System	0.31	2.44	1.42
Baseline	0.33	1.15	1.84
Percent Difference	6.1	112.2	22.8
'75 Nova Baseline	0.19	1.24	0.86
Estimated w/air mod.	0.18	2.63	0.66
Goals	0.25	2.11	0.93
Percent Difference	-28.0%	+24.6%	29.0%

Score = 5

2. Sulfate Emissions (SET) mg/km

Air Modulation System:	0.57 mg/km
Goal:	3.11 mg/km

Score = 10

3. Fuel Consumption

	ℓ/100 km		
	FTP	FET	Composite
Air Modulation System	18.55	14.03	16.52
Baseline	17.54	13.36	15.66
Percent Change	+5.76	+5.02	+5.4

Score = 5

4. Durability

It is estimated that system will require some maintenance in 80,000 km (50,000 miles). To be on conservative side assume system will need to be replaced at 40,000 km (25,000 miles)

$$\text{Score} = \frac{25{,}000}{50{,}000} \times 10 = 5$$

5. Cost

a.) From other studies of automotive spare parts cost:
retail = 1.667 * wholesale

b.) Industrial discounts are approximately the same. For example Swagelok gives 30% discount on 10,000 or more.

c.) Assume manufacturer makes 15 profit on wholesale price.

d.) Assume that the air modulation valve can be combined with the present air pump diverter valve and that the vacuum switch can be combined with the EGR vacuum switch. Assume that these combinations result in a 50 percent increase in the price of the part.

e.) Cost of Air Modulation System:

	Retail	Wholesale	Mfgr. Cost	Total Additional Cost to Mfgr.
Mod. Valve	8.00	5.07	4.41	2.21
Vac Switch	5.60	3.57	3.10	1.55
Clutch	16.00	10.00 (with modification)	8.70	8.70
				$12.46

or as a very conservative estimate this system should cost the mfgr. less that $13.00

f.) This is the least cost system therefore score = 10.

Sulfate Control Durability Demonstration
Control System Evaluation Sheet

System High Temperature Exhaust

Evaluation Item	Score	Weighting Factor	Weighted Score	Max Possible Weighted Score
1. Meets gaseous emission goals	10	2.0	20	(20)
2. Sulfate emissions	0	1.5	0	(15)
3. Fuel economy	5	1.5	7.5	(15)
4. Durability	10	1.0	10	(10)
5. Cost	3.3	1.0	3.3	(10)
TOTAL SCORE		---	40.8	(70)

Scoring Criteria

Item	
1. Meets gaseous emission goals	(a) If HC, CO, NO_x below 0.25, 2.11 and 0.93 g/km respectively, score = 10. (b) If only one of the gaseous emissions is over the goal and it does not exceed the goal by more than 50%, score = 5. (c) If more than one of the gaseous emissions is over the goal, score = 0.
2. Sulfate emissions	(a) If 3.1 mg/km or less on SET test score = 10. (b) If greater than 6.2 mg/km, score = 0. (c) Between 3.1 and 6.2 mg/km, score = 20 - (3.226 x Sulfate emissions, mg/km)
3. Fuel economy	(a) If fuel economy improved by more than 5% score = 10. (b) If fuel economy ±5%, score = 5. (c) If fuel economy decreased by more than 5%, score = 0.
4. Durability	(a) Estimate life of system without repairs or replacement (only addition parts added for sulfate control - not total system) (b) Score = $\frac{\text{Miles}}{50000} \times 10$
5. Cost	(a) This is a relative evaluation - least cost system score = 10. (b) For other systems: score = $\frac{\text{least cost}}{\text{system cost}} \times 10$

1. Gaseous Emissions (FTP)

	HC (g/km)	CO (g/km)	NO_x (g/km)
Baseline	0.19	1.24	0.86
w/port liners	0.16	2.05	0.86
Goals	0.25	2.11	0.93
Percent Difference	-36.0%	-2.8%	-7.5%

Score = 10

2. Sulfate Emission (SET)

w/port liners	6.30 mg/km
Goal	3.11 mg/km
Percent Difference	+103%

Score = 0

3. Fuel Economy

	FTP (ℓ/100 km)	FET (ℓ/100 km)	Composite (ℓ/100 km)
Baseline	17.39	12.71	15.28
High Temp System	18.19	13.15	15.92
Percent Change	+4.6%	+3.5%	4.2%

Score = 5

4. Durability

There is no reason why properly designed portliners and manifolds should not last 50,000 miles. Therefore score = 10.

5. The cost of portliners and high temperature manifolds in quantity is unknown. However they are estimated to cost 3 times as much as the air modulation system.

Score = 1/3 x 10 = 3.3

APPENDIX B

COMPUTER PRINTOUTS
FOR
AIR MODULATION SYSTEM DEVELOPMENT TESTS ON A 1976 CHEVROLET IMPALA
(Tests in Chronological Order)

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                        TABLE                    VEHICLE EMISSION RESULTS
                                           1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.            TEST NO. 1          DATE  3/17/77                   MFGR. CODE   -0                YR.  1976
VEHICLE MODEL  CHEVROLET IMPALA         ENGINE   5.74 LITRE 8           CURB WT.     0 KG              GVM     0 KG

BAROMETER 735.84 MM OF HG.
DRY BULB TEMP.   25.0 DEG. C                                     WET BULB TEMP  20.0 DEG. C
REL. HUMIDITY     63 PCT.                                         ABS. HUMIDITY  13.0 GRAMS/KG

EXHAUST EMISSIONS

    BLOWER DIF. PRESS., G2, 660.4 MM. H2O                        BLOWER INLET PRESS., G1 660.4 MM. H2O
    BAG RESULTS                                                  BLOWER INLET TEMP.    43 DEG. C
    BAG NO.                                    1              2              3
    BLOWER REVOLUTIONS                       40620          69847          40649
    HC   SAMPLE  METER READING/SCALE          20.3/3         38.9/2         35.3/3
    HC   SAMPLE  PPM                          203            39             353
    HC   BACKGRD METER READING/SCALE           1.1/3          1.1/3         10.5/2
    HC   BACKGRD PPM                           11             11             10
    CO   SAMPLE  METER READING/SCALE          53.7/3         78.3/*         29.2/3
    CO   SAMPLE  PPM                          1333           351            686
    CO   BACKGRD METER READING/SCALE            .2/3           .2/3           .5/*
    CO   BACKGRD PPM                            4              4              1
    CO2  SAMPLE  METER READING/SCALE          44.1/2         72.0/3         94.6/3
    CO2  SAMPLE  PERCENT                      1.96           1.30           1.77
    CO2  BACKGRD METER READING/SCALE           1.7/2          1.9/2          3.7/3
    CO2  BACKGRD PERCENT                       .06            .07            .06
    NOX  SAMPLE  METER READING/SCALE          96.0/2         38.4/2         89.4/2
    NOX  SAMPLE  PPM                          96.0           38.4           89.4
    NOX  BACKGRD METER READING/SCALE            .8/2          1.0/2           .8/2
    NOX  BACKGRD PPM                            .8            1.0             .8
    SO2  SAMPLE  METER READING/SCALE          -0.0/*         -0.0/*         -0.0/*
    SO2  SAMPLE  PPM                          -0.0           -0.0           -0.0
    SO2  BACKGRD METER READING/SCALE          -0.0/*         -0.0/*         -0.0/*
    SO2  BACKGRD PPM                          -0.0           -0.0           -0.0

    HC   CONCENTRATION PPM                    194            29             344
    CO   CONCENTRATION PPM                    1252           332            648
    CO2  CONCENTRATION PCT                    1.90           1.24           1.73
    NOX  CONCENTRATION PPM                    95.3           37.5           88.7
    SO2  CONCENTRATION PPM                    0.0            0.0            0.0
    HC   MASS GRAMS                           8.49           2.19           15.09
    CO   MASS GRAMS                         110.85          50.48           57.37
    CO2  MASS GRAMS                        2662.83        2988.35        2414.89
    NOX  MASS GRAMS                          14.97          10.13          13.94
    SO2  MASS GRAMS                           0.00           0.00           0.00

    WEIGHTED MASS HC       1.20 GRAMS/KILOMETRE
    WEIGHTED MASS CO      10.84 GRAMS/KILOMETRE
    WEIGHTED MASS CO2    456.59 GRAMS/KILOMETRE
    WEIGHTED MASS NOX      2.03 GRAMS/KILOMETRE
    WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

  CARBON BALANCE FUEL CONSUMPTION = 20.34 LITRES PER HUNDRED KILOMETRES
  TOTAL CVS FLOW =   282.9 STD. CU. METRES
```

```
      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER

   DATE  3/17/77                TIME    -0 HRS.         TEST NO.  2
   MODEL  1976 CHEVY IMPALA     SET-7                   ENGINE 5.7 LITREV 8
   DRIVER   SR                  TEST WT.  2177 KG.      GVW    0 KG
   WET BULB TEMP  18 C          DRY BULB TEMP  25 C     REL. HUM.  49.2 PCT
   SPEC. HUM.  10.0 GRAM/KG     BARO.  735.3 MM  HG.    MEASURED FUEL  0.00 KG

     RUN DURATION          23.29 MINUTES
     BLOWER INLET PRESS. 660.4  MM. H2O
     BLOWER DIF.  PRESS. 660.4  MM  H2O
     BLOWER INLET TEMP.      43  DEG. C
     DYNO REVOLUTIONS     31926
     BLOWER REVOLUTIONS   112395
     BLOWER CU. CM /REV.  2234

     BAG RESULTS
      HC  SAMPLE  METER READING/SCALE              43.1/2
      HC  SAMPLE  PPM                                 43
      HC  BACKGRD METER READING/SCALE               9.6/2
      HC  BACKGRD PPM                                 10
      CO  SAMPLE  METER READING/SCALE              23.2/3
      CO  SAMPLE  PPM                                537
      CO  BACKGRD METER READING/SCALE                .3/3
      CO  BACKGRD PPM                                  6
      CO2 SAMPLE  METER READING/SCALE              45.2/2
      CO2 SAMPLE  PERCENT                            2.02
      CO2 BACKGRD METER READING/SCALE               1.7/2
      CO2 BACKGRD PERCENT                             .06
      NOX SAMPLE  METER READING/SCALE              35.5/3
      NOX SAMPLE  PPM                              106.5
      NOX BACKGRD METER READING/SCALE                .3/3
      NOX BACKGRD PPM                                  .9
      HC  CONCENTRATION PPM                           35
      CO  CONCENTRATION PPM                          503
      CO2 CONCENTRATION PCT                          1.96
      NOX CONCENTRATION PPM                        105.7
      SO2 COCENTRATION PPM                           0.0
      HC  MASS (GRAMS)                              4.24
      CO  MASS (GRAMS)                            122.99
      CO2 MASS (GRAMS)                           7591.60
      NOX MASS (GRAMS)                             41.57
      SO2 MASS (GRAMS)                              0.00

   HC  GRAMS/KILOMETRE       .19
   CO  GRAMS/KILOMETRE      5.59
   CO2 GRAMS/KILOMETRE    345
   NOX GRAMS/KILOMETRE      1.89
   SO2 GRAMS/KILOMETRE      0.00

   HC  GRAMS/KG OF FUEL   1.72     HC  GRAMS/MIN     .18
   CO  GRAMS/KG OF FUEL   50.0     CO  GRAMS/MIN     5.3
   CO2 GRAMS/KG OF FUEL   3085     CO2 GRAMS/MIN     326
   NOX GRAMS/KG OF FUEL  16.90     NOX GRAMS/MIN    1.78
   SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN    0.00
   CARBON BALANCE FUEL ECONOMY =   15.22 LITRES PER HUNDRED KILOMETERS
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                           VEHICLE NUMBER

DATE  3/17/77               TIME    -0 HRS.         TEST NO.  2
MODEL  1976 CHEVY IMPALA    SET-7                   ENGINE 5.7 LITREO
RUN DURATION   23.29 MIN.   DISTANCE DRIVEN  22.01 KILOMETRES
CVS BLOWER TEST VOL.  251.13 ACT. CU. METRES

                             SAMPLE                 BACKGROUND
SULFATE DATA                 ------                 ----------

 FILTER NO.               47FH-2796
 SAMPLE VOL. CU. FT.         18.50                     1.00
 SAMPLE TEMP. DEG. F            85                       70
 SAMPLE AREA SQ. IN.      28283.00                     0.00
 DILUTION FACTOR                 1                        1
 STAND. DEN. MICROG/ML        5.00                     5.00
 STAND. AREA SQ. IN.     219365.00                     1.00
 SO4,MICROG/FILTER           6.447                    0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                     1.00
 SAMPLE TEMP. DEG. F            70                       70
 AREA,BUBBLER 1               0.00                     0.00
 DIL. FACT.,BUBBLER 1            1                        1
 AREA,BUBBLER 2               0.00                     0.00
 DIL. FACT.,BUBBLER 2            1                        1
 STAND. DEN. MICROG/ML        5.00                     5.00
 STAND. AREA,SQ. IN.          1.00                     1.00
 SO2, MILLIG/BUBBLER 1       0.000                    0.000
 SO2, MILLIG/BUBBLER 2       0.000                    0.000
 SO2, PPM                      0.0                      0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST             3.461
 NET H2SO4,MILLIGRAM/TEST               3.533
 NET SO2,GRAM/TEST                      0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         .157
 NET H2SO4,MILLIGRAM/KILOMETRE           .161
 NET SO2,GRAM/KILOMETRE                 0.000

SULFUR BALANCE
 FUEL WT., 2461 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2      H2SO4        SO2 + H2SO4
                            ----     -----    --------     -----------
              SULFUR,GRAMS   .76     0.000      .0012           .0012
              PCT. RECOVERY           0.00        .15             .15
```

```
                    TABLE                    VEHICLE EMISSION RESULTS
                                         1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.    7      TEST NO.   R        DATE  3/30/77                    MFGR. CODE   -0                YR.  1976
VEHICLE MODEL  CHEVY IMPALA            ENGINE   5.74 LITRE 8            CURB WT.     0 KG              GVM      0 KG

BAROMETER 740.92 MM OF HG.                                            WET BULB TEMP  14.4 DEG. C
DRY BULB TEMP.   25.6 DEG. C                                           ABS. HUMIDITY   5.8 GRAMS/KG
REL. HUMIDITY     28 PCT.

EXHAUST EMISSIONS
                                                                      BLOWER INLET PRESS., G1 685.8 MM. H2O
    BLOWER DIF. PRESS., G2, 685.8 MM. H2O                             BLOWER INLET TEMP.   43 DEG. C
    BAG RESULTS
    BAG NO.                                       1            2            3
    BLOWER REVOLUTIONS                          40547        69687        40629
    HC   SAMPLE  METER READING/SCALE            31.5/ 3      55.7/ 2      18.2/ 3
    HC   SAMPLE  PPM                            315           56          182
    HC   BACKGRD METER READING/SCALE              .9/ 3       1.0/ 3       6.3/ 2
    HC   BACKGRD PPM                               9           10            6
    CO   SAMPLE  METER READING/SCALE            77.0/11      29.3/13      69.2/12
    CO   SAMPLE  PPM                            342           27          157
    CO   BACKGRD METER READING/SCALE              .8/11        .6/11       1.4/13
    CO   BACKGRD PPM                               2            2            1
    CO2  SAMPLE  METER READING/SCALE            49.5/ 2      32.8/ 2      43.5/ 2
    CO2  SAMPLE  PERCENT                        2.25         1.38         1.92
    CO2  BACKGRD METER READING/SCALE             1.6/ 2       1.3/ 2       1.2/ 2
    CO2  BACKGRD PERCENT                         .06          .05          .04
    NOX  SAMPLE  METER READING/SCALE            50.5/ 3      28.7/ 3      47.3/ 3
    NOX  SAMPLE  PPM                           151.5         86.1        141.9
    NOX  BACKGRD METER READING/SCALE              .5/ 3        .5/ 3        .4/ 3
    NOX  BACKGRD PPM                            1.5          1.5          1.2
    SO2  SAMPLE  METER READING/SCALE            -0.0/-0      -0.0/-0      -0.0/-0
    SO2  SAMPLE  PPM                            -0.0         -0.0         -0.0
    SO2  BACKGRD METER READING/SCALE            -0.0/-0      -0.0/-0      -0.0/-0
    SO2  BACKGRD PPM                            -0.0         -0.0         -0.0

    HC   CONCENTRATION PPM                       308           47          177
    CO   CONCENTRATION PPM                       323           25          148
    CO2  CONCENTRATION PCT                      2.21         1.34         1.89
    NOX  CONCENTRATION PPM                     150.3         84.8        140.9
    SO2  CONCENTRATION PPM                       0.0          0.0          0.0
    HC   MASS GRAMS                            13.50         3.53         7.77
    CO   MASS GRAMS                            28.60         3.78        13.18
    CO2  MASS GRAMS                          3088.92      3213.10      2647.73
    NOX  MASS GRAMS                            18.82        18.24        17.68
    SO2  MASS GRAMS                             0.00         0.00         0.00

    WEIGHTED MASS HC      1.14 GRAMS/KILOMETRE
    WEIGHTED MASS CO      1.95 GRAMS/KILOMETRE
    WEIGHTED MASS CO2   501.39 GRAMS/KILOMETRE
    WEIGHTED MASS NOX     3.02 GRAMS/KILOMETRE
    WEIGHTED MASS SO2     0.00 GRAMS/KILOMETRE

   CARBON BALANCE FUEL CONSUMPTION = 21.66 LITRES PER HUNDRED KILOMETRES
   TOTAL CVS FLOW =   283.3 STD. CU. METRES
```

```
       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER

 DATE  3/30/77              TIME     -0 HRS.        TEST NO.  2
 MODEL  1976 CHEVY IMPALA   SET 7                   ENGINE 5.7 LITRE  8
 DRIVER   SH                TEST WT.  2177 KG.      GVW    0 KG
 WET BULB TEMP  16 C        DRY BULB TEMP  27 C     REL. HUM.  29.4 PCT
 SPEC. HUM.   6.5 GRAM/KG   BARO.  740.9 MM  HG.    MEASURED FUEL  0.00 KG

   RUN DURATION           23.27 MINUTES
   BLOWER INLET PRESS. 762.0  MM. H2O
   BLOWER DIF.  PRESS. 762.0  MM  H2O
   BLOWER INLET TEMP.     44  DEG. C
   DYNO REVOLUTIONS     31908
   BLOWER REVOLUTIONS    112082
   BLOWER CU. CM /REV.  2229

   BAG RESULTS
    HC   SAMPLE  METER READING/SCALE               11.1/3
    HC   SAMPLE  PPM                                111
    HC   BACKGRD METER READING/SCALE                 .8/3
    HC   BACKGRD PPM                                  8
    CO   SAMPLE  METER READING/SCALE               74.9/*
    CO   SAMPLE  PPM                                328
    CO   BACKGRD METER READING/SCALE                 .9/*
    CO   BACKGRD PPM                                  3
    CO2  SAMPLE  METER READING/SCALE               49.2/2
    CO2  SAMPLE  PERCENT                           2.24
    CO2  BACKGRD METER READING/SCALE                1.6/2
    CO2  BACKGRD PERCENT                             .06
    NOX  SAMPLE  METER READING/SCALE               55.9/3
    NOX  SAMPLE  PPM                              167.7
    NOX  BACKGRD METER READING/SCALE                 .4/3
    NOX  BACKGRD PPM                                1.2
    HC   CONCENTRATION PPM                          104
    CO   CONCENTRATION PPM                          309
    CO2  CONCENTRATION PCT                         2.19
    NOX  CONCENTRATION PPM                        166.7
    SO2  COCENTRATION PPM                           0.0
    HC   MASS (GRAMS)                             12.51
    CO   MASS (GRAMS)                             74.75
    CO2  MASS (GRAMS)                           8366.62
    NOX  MASS (GRAMS)                             58.26
    SO2  MASS (GRAMS)                              0.00

 HC   GRAMS/KILOMETRE       .57
 CO   GRAMS/KILOMETRE      3.41
 CO2  GRAMS/KILOMETRE    381
 NOX  GRAMS/KILOMETRE      2.66
 SO2  GRAMS/KILOMETRE      0.00

 HC   GRAMS/KG OF FUEL   4.65      HC   GRAMS/MIN     .54
 CO   GRAMS/KG OF FUEL   27.8      CO   GRAMS/MIN    3.2
 CO2  GRAMS/KG OF FUEL   3111      CO2  GRAMS/MIN    360
 NOX  GRAMS/KG OF FUEL  21.66      NOX  GRAMS/MIN   2.50
 SO2  GRAMS/KG OF FUEL   0.00      SO2  GRAMS/MIN   0.00
 CARBON BALANCE FUEL ECONOMY =   16.69 LITRES PER HUNDRED KILOMETERS
```

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```
       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER

DATE  3/30/77              TIME    -0 HRS.        TEST NO.  2
MODEL  1976 CHEVY IMPALA   SET 7                  ENGINE 5.7 LITRES
RUN DURATION    23.27 MIN.  DISTANCE DRIVEN  21.93 KILOMETRES
CVS BLOWER TEST VOL.  244.86 ACT. CU. METRES

                                SAMPLE                     BACKGROUND
SULFATE DATA                    ------                     ----------

 FILTER NO.                  47FH2800
 SAMPLE VOL. CU. FT.            11.96                         1.00
 SAMPLE TEMP. DEG. F               84                           70
 SAMPLE AREA SQ. IN.        233270.00                         0.00
 DILUTION FACTOR                    1                            1
 STAND. DEN. MICROG/ML           5.00                         1.00
 STAND. AREA SQ. IN.        202281.00                         1.00
 SO4,MICROG/FILTER             57.660                        0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.             1.00                         1.00
 SAMPLE TEMP. DEG. F               70                           70
 AREA,BUBBLER 1                  0.00                         0.00
 DIL. FACT.,BUBBLER 1               1                            1
 AREA,BUBBLER 2                  0.00                         0.00
 DIL. FACT.,BUBBLER 2               1                            1
 STAND. DEN. MICROG/ML           1.00                         1.00
 STAND. AREA,SQ. IN.             1.00                         1.00
 SO2, MILLIG/BUBBLER 1          0.000                        0.000
 SO2, MILLIG/BUBBLER 2          0.000                        0.000
 SO2, PPM                         0.0                          0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST             48.402
 NET H2SO4,MILLIGRAM/TEST               49.418
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         2.207
 NET H2SO4,MILLIGRAM/KILOMETRE           2.253
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2689 GRAMS       SULFUR IN FUEL, .0320 PCT.
                             FUEL      SO2        H2SO4       SO2 + H2SO4
                             ----     -----      -------     -----------
          SULFUR,GRAMS        .86     0.000       .0162          .0162
          PCT. RECOVERY               0.00        1.88            1.88
```

```
                   TABLE                     VEHICLE EMISSION RESULTS
                                       1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.    7        TEST NO. 1        DATE  4/ 1/77                 MFGR. CODE   -0                  YR.  1976
VEHICLE MODEL  CHEVY IMPALA            ENGINE   5.74 LITRE 8         CURB WT.     0 KG                GVM      0 KG

BAROMETER 740.92 MM OF HG.                                         WET BULB TEMP  16.1 DEG. C
DRY BULB TEMP.    22.2 DEG. C                                       ABS. HUMIDITY   9.1 GRAMS/KG
REL. HUMIDITY      53 PCT.

EXHAUST EMISSIONS
                                                                   BLOWER INLET PRESS., G1 711.2 MM. H2O
    BLOWER DIF. PRESS., G2, 711.2 MM. H2O                          BLOWER INLET TEMP.   43 DEG. C
    BAG RESULTS
    BAG NO.                                       1              2              3
    BLOWER REVOLUTIONS                          40635          69746          40635
    HC   SAMPLE  METER READING/SCALE             30.0/3         42.6/2         13.9/3
    HC   SAMPLE  PPM                             300            43             139
    HC   BACKGRD METER READING/SCALE             1.3/3          1.1/3          9.7/2
    HC   BACKGRD PPM                             13             11             10
    CO   SAMPLE  METER READING/SCALE            94.2/*         14.9/*         74.2/*
    CO   SAMPLE  PPM                             481            14             170
    CO   BACKGRD METER READING/SCALE             3.2/*          1.7/*          5.3/*
    CO   BACKGRD PPM                             10             5              5
    CO2  SAMPLE  METER READING/SCALE            44.9/2         29.9/2         40.9/2
    CO2  SAMPLE  PERCENT                        2.00           1.24           1.79
    CO2  BACKGRD METER READING/SCALE             1.7/2          1.5/2          2.0/2
    CO2  BACKGRD PERCENT                        .06            .05            .07
    NOX  SAMPLE  METER READING/SCALE            39.5/3         57.7/2         37.2/3
    NOX  SAMPLE  PPM                           118.5           57.7          111.6
    NOX  BACKGRD METER READING/SCALE              .4/3           .4/3          1.2/2
    NOX  BACKGRD PPM                            1.2            1.2            1.2
    SO2  SAMPLE  METER READING/SCALE            -0.0/*         -0.0/*         -0.0/*
    SO2  SAMPLE  PPM                            -0.0           -0.0           -0.0
    SO2  BACKGRD METER READING/SCALE            -0.0/*         -0.0/*         -0.0/*
    SO2  BACKGRD PPM                            -0.0           -0.0           -0.0

    HC   CONCENTRATION PPM                        289             33            131
    CO   CONCENTRATION PPM                        446              9            157
    CO2  CONCENTRATION PCT                       1.95           1.19           1.72
    NOX  CONCENTRATION PPM                      117.5           56.6          110.6
    SO2  CONCENTRATION PPM                        0.0            0.0            0.0
    HC   MASS GRAMS                             12.67           2.45           5.72
    CO   MASS GRAMS                             39.46           1.35          13.92
    CO2  MASS GRAMS                           2721.69        2851.36        2408.90
    NOX  MASS GRAMS                             16.21          13.41          15.25
    SO2  MASS GRAMS                              0.00           0.00           0.00

    WEIGHTED MASS HC        .93 GRAMS/KILOMETRE
    WEIGHTED MASS CO       2.18 GRAMS/KILOMETRE
    WEIGHTED MASS CO2    447.05 GRAMS/KILOMETRE
    WEIGHTED MASS NOX      2.41 GRAMS/KILOMETRE
    WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

   CARBON BALANCE FUEL CONSUMPTION = 19.33 LITRES PER HUNDRED KILOMETRES
   TOTAL CVS FLOW =    282.4 STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER   7

DATE  4/ 1/77                 TIME    -0 HRS.        TEST NO.  2
MODEL  1976 CHEVY IMPALA      SET-7                  ENGINE 5.7 LITREV 8
DRIVER   HP                   TEST WT.     0 KG.     GVW     0 KG
WET BULB TEMP  16 C           DRY BULB TEMP  21 C    REL. HUM.  55.9 PCT
SPEC. HUM.    9.0 GRAM/KG     BARO.  737.9 MM  HG.   MEASURED FUEL  0.00 KG

  RUN DURATION          23.28 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     40  DEG. C
  DYNO REVOLUTIONS     31303
  BLOWER REVOLUTIONS   112285
  BLOWER CU. CM /REV.  2222

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE             9.8/3
   HC   SAMPLE  PPM                               98
   HC   BACKGRD METER READING/SCALE             1.0/3
   HC   BACKGRD PPM                               10
   CO   SAMPLE  METER READING/SCALE            22.9/3
   CO   SAMPLE  PPM                              530
   CO   BACKGRD METER READING/SCALE              .6/3
   CO   BACKGRD PPM                               13
   CO2  SAMPLE  METER READING/SCALE            45.8/2
   CO2  SAMPLE  PERCENT                         2.05
   CO2  BACKGRD METER READING/SCALE             1.9/2
   CO2  BACKGRD PERCENT                          .07
   NOX  SAMPLE  METER READING/SCALE            35.3/3
   NOX  SAMPLE  PPM                            105.9
   NOX  BACKGRD METER READING/SCALE              .4/3
   NOX  BACKGRD PPM                              1.2
   HC   CONCENTRATION PPM                         90
   CO   CONCENTRATION PPM                        489
   CO2  CONCENTRATION PCT                       1.99
   NOX  CONCENTRATION PPM                      104.9
   SO2  COCENTRATION PPM                         0.0
   HC   MASS (GRAMS)                           10.86
   CO   MASS (GRAMS)                          119.67
   CO2  MASS (GRAMS)                         7698.03
   NOX  MASS (GRAMS)                           39.89
   SO2  MASS (GRAMS)
                                                0.00

HC   GRAMS/KILOMETRE       .50
CO   GRAMS/KILOMETRE      5.54
CO2  GRAMS/KILOMETRE    352
NOX  GRAMS/KILOMETRE      1.85
SO2  GRAMS/KILOMETRE      0.00

HC   GRAMS/KG OF FUEL    4.35     HC   GRAMS/MIN     .47
CO   GRAMS/KG OF FUEL   47.9      CO   GRAMS/MIN     5.1
CO2  GRAMS/KG OF FUEL   3080      CO2  GRAMS/MIN     331
NOX  GRAMS/KG OF FUEL   15.96     NOX  GRAMS/MIN    1.71
SO2  GRAMS/KG OF FUEL    0.00     SO2  GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =   15.76 LITRES PER HUNDRED KILOMETERS
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      TABLE       EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER   7

DATE  4/ 1/77               TIME    -0 HRS.        TEST NO.  2
MODEL  1976 CHEVY IMPALA    SET-7                  ENGINE 5.7 LITREU
RUN DURATION   23.28 MIN.   DISTANCE DRIVEN  21.58 KILOMETRES
CVS BLOWER TEST VOL.  244.47 ACT. CU. METRES

                            SAMPLE                 BACKGROUND
SULFATE DATA                ------                 ----------

 FILTER NO.               47-FH-2803
 SAMPLE VOL. CU. FT.         15.38                    1.00
 SAMPLE TEMP. DEG. F            72                      70
 SAMPLE AREA SQ. IN.      36934.00                    0.00
 DILUTION FACTOR                 1                       1
 STAND. DEN. MICROG/ML       20.00                    1.00
 STAND. AREA SQ. IN.     212327.00                    1.00
 SO4,MICROG/FILTER          34.790                   0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                    1.00
 SAMPLE TEMP. DEG. F            70                      70
 AREA,BUBBLER 1               0.00                    0.00
 DIL. FACT.,BUBBLER 1            1                       1
 AREA,BUBBLER 2               0.00                    0.00
 DIL. FACT.,BUBBLER 2            1                       1
 STAND. DEN. MICROG/ML        1.00                    1.00
 STAND. AREA,SQ. IN.          1.00                    1.00
 SO2, MILLIG/BUBBLER 1       0.000                   0.000
 SO2, MILLIG/BUBBLER 2       0.000                   0.000
 SO2, PPM                      0.0                     0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST             22.771
 NET H2SO4,MILLIGRAM/TEST               23.250
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         1.055
 NET H2SO4,MILLIGRAM/KILOMETRE           1.077
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2499 GRAMS     SULFUR IN FUEL. .0310 PCT.
                           FUEL      SO2       H2SO4      SO2 + H2SO4
                           ----     -----     -------    -----------
            SULFUR,GRAMS    .77     0.000      .0076          .0076
            PCT. RECOVERY            0.00        .98            .98
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                    TABLE                      VEHICLE EMISSION RESULTS
                                            1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.    7      TEST NO.   8          DATE  4/ 6/77                  MFGR. CODE    -0                  YR.  1976
VEHICLE MODEL  CHEVY IMPALA              ENGINE    5.74 LITRE 8          CURB WT.      0 KG                GVM     0 KG

BAROMETER 749.55 MM OF HG.                                           WET BULB TEMP  11.7 DEG. C
DRY BULB TEMP.    20.6 DEG. C                                         ABS. HUMIDITY   4.9 GRAMS/KG
REL. HUMIDITY      32 PCT.

EXHAUST EMISSIONS
                                                                     BLOWER INLET PRESS., G1 736.6 MM. H2O
     BLOWER DIF. PRESS., G2, 736.6 MM. H2O                           BLOWER INLET TEMP.   42 DEG. C
     BAG RESULTS
     BAG NO.                                        1              2              3
     BLOWER REVOLUTIONS                           40585          69604          40595
     HC    SAMPLE  METER READING/SCALE           13.5/ 3        35.8/ 2        20.0/ 2
     HC    SAMPLE  PPM                           135             36             20
     HC    BACKGRD METER READING/SCALE             .6/ 3          .8/ 3         6.0/ 2
     HC    BACKGRD PPM                             6              8              6
     CO    SAMPLE  METER READING/SCALE           31.7/ 3        55.1/12        68.6/12
     CO    SAMPLE  PPM                           749            120            155
     CO    BACKGRD METER READING/SCALE             .1/ 3          .1/ 3          .8/12
     CO    BACKGRD PPM                             2              2              1
     CO2   SAMPLE  METER READING/SCALE           44.3/ 2        71.8/ 3        89.4/ 3
     CO2   SAMPLE  PERCENT                       1.97           1.30           1.67
     CO2   BACKGRD METER READING/SCALE            1.7/ 2         1.9/ 2         4.3/ 3
     CO2   BACKGRD PERCENT                        .06            .07            .07
     NOX   SAMPLE  METER READING/SCALE           47.3/ 3        62.2/ 2        40.9/ 3
     NOX   SAMPLE  PPM                          141.9           62.2          122.7
     NOX   BACKGRD METER READING/SCALE             .6/ 3          .5/ 3         1.2/ 2
     NOX   BACKGRD PPM                            1.8            1.5            1.2
     SO2   SAMPLE  METER READING/SCALE          -0.0/-0        -0.0/-0        -0.0/-0
     SO2   SAMPLE  PPM                          -0.0           -0.0           -0.0
     SO2   BACKGRD METER READING/SCALE          -0.0/-0        -0.0/-0        -0.0/-0
     SO2   BACKGRD PPM                          -0.0           -0.0           -0.0

     HC    CONCENTRATION PPM                     130             29             15
     CO    CONCENTRATION PPM                     711            114            147
     CO2   CONCENTRATION PCT                    1.92           1.24           1.61
     NOX   CONCENTRATION PPM                   140.4           60.8          121.7
     SO2   CONCENTRATION PPM                     0.0            0.0            0.0
     HC    MASS GRAMS                           5.75           2.17            .65
     CO    MASS GRAMS                          63.60          17.48          13.17
     CO2   MASS GRAMS                        2703.88        2999.49        2270.56
     NOX   MASS GRAMS                          17.29          12.85          14.99
     SO2   MASS GRAMS                           0.00           0.00           0.00

     WEIGHTED MASS HC       .42 GRAMS/KILOMETRE
     WEIGHTED MASS CO      4.34 GRAMS/KILOMETRE
     WEIGHTED MASS CO2   452.15 GRAMS/KILOMETRE
     WEIGHTED MASS NOX     2.39 GRAMS/KILOMETRE
     WEIGHTED MASS SO2     0.00 GRAMS/KILOMETRE

   CARBON BALANCE FUEL CONSUMPTION = 19.62 LITRES PER HUNDRED KILOMETRES
   TOTAL CVS FLOW =   285.3 STD. CU. METRES
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER   7

DATE  4/ 6/77                TIME      2 HRS.        TEST NO. -0
MODEL  1976 CHEVY IMPALA     SET-7                   ENGINE 5.7 LITRE  8
DRIVER   BP                  TEST WT.     0 KG.      GVW    0 KG
WET BULB TEMP  12 C          DRY BULB TEMP  21 C     REL. HUM.  33.1 PCT
SPEC. HUM.   5.2 GRAM/KG     BARO.  749.6 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION          23.29 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H2O
  BLOWER DIF.  PRESS. 736.6  MM  H2O
  BLOWER INLET TEMP.     42  DEG. C
  DYNO REVOLUTIONS     32587
  BLOWER REVOLUTIONS   112068
  BLOWER CU. CM /REV.  2227

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE          14.5/2
   HC  SAMPLE  PPM                            14
   HC  BACKGRD METER READING/SCALE           6.2/2
   HC  BACKGRD PPM                             6
   CO  SAMPLE  METER READING/SCALE          60.0/*
   CO  SAMPLE  PPM                           133
   CO  BACKGRD METER READING/SCALE            .8/*
   CO  BACKGRD PPM                             1
   CO2 SAMPLE  METER READING/SCALE          45.1/2
   CO2 SAMPLE  PERCENT                      2.01
   CO2 BACKGRD METER READING/SCALE           2.0/2
   CO2 BACKGRD PERCENT                       .07
   NOX SAMPLE  METER READING/SCALE          53.8/3
   NOX SAMPLE  PPM                         161.4
   NOX BACKGRD METER READING/SCALE            .5/3
   NOX BACKGRD PPM                           1.5
   HC  CONCENTRATION PPM                       9
   CO  CONCENTRATION PPM                     125
   CO2 CONCENTRATION PCT                    1.95
   NOX CONCENTRATION PPM                   160.1
   SO2 COCENTRATION PPM                     0.0
   HC  MASS (GRAMS)                         1.13
   CO  MASS (GRAMS)                        30.80
   CO2 MASS (GRAMS)                      7593.80
   NOX MASS (GRAMS)                        54.91
   SO2 MASS (GRAMS)                         0.00

HC  GRAMS/KILOMETRE       .05
CO  GRAMS/KILOMETRE      1.37
CO2 GRAMS/KILOMETRE   338
NOX GRAMS/KILOMETRE      2.44
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL    .47     HC  GRAMS/MIN    .05
CO  GRAMS/KG OF FUEL   12.8     CO  GRAMS/MIN    1.3
CO2 GRAMS/KG OF FUEL   3148     CO2 GRAMS/MIN    326
NOX GRAMS/KG OF FUEL  22.76     NOX GRAMS/MIN   2.36
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   14.54 LITRES PER HUNDRED KILOMETERS
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        TABLE         EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                               VEHICLE NUMBER    7

  DATE  4/ 6/77                 TIME      2 HRS.          TEST NO. -0
  MODEL  1976 CHEVY IMPALA      SET-7                     ENGINE 5.7 LITREO
  RUN DURATION    23.29 MIN.    DISTANCE DRIVEN   22.47  KILOMETRES
  CVS BLOWER TEST VOL.   244.56 ACT. CU. METRES

                                    SAMPLE                  BACKGROUND
  SULFATE DATA                      ------                  ----------

   FILTER NO.                   47FH-2804
   SAMPLE VOL. CU. FT.              13.69                      1.00
   SAMPLE TEMP. DEG. F                 76                        70
   SAMPLE AREA SQ. IN.          177881.00                      0.00
   DILUTION FACTOR                      1                         1
   STAND. DEN. MICROG/ML             5.00                      1.00
   STAND. AREA SQ. IN.          212747.00                      1.00
   SO4,MICROG/FILTER               41.806                     0.000

  SULFUR DIOXIDE DATA

   SAMPLE VOL. CU. FT.               1.00                      1.00
   SAMPLE TEMP. DEG. F                 70                        70
   AREA,BUBBLER 1                    0.00                      0.00
   DIL. FACT.,BUBBLER 1                 1                         1
   AREA,BUBBLER 2                    0.00                      0.00
   DIL. FACT.,BUBBLER 2                 1                         1
   STAND. DEN. MICROG/ML             1.00                      1.00
   STAND. AREA,SQ. IN.               1.00                      1.00
   SO2, MILLIG/BUBBLER 1            0.000                     0.000
   SO2, MILLIG/BUBBLER 2            0.000                     0.000
   SO2, PPM                           0.0                       0.0

  SULFATE AND SO2 EMISSIONS

   NET SULFATE,MILLIGRAM/TEST               30.679
   NET H2SO4,MILLIGRAM/TEST                 31.323
   NET SO2,GRAM/TEST                         0.000
   NET SULFATE,MILLIGRAM/KILOMETRE           1.365
   NET H2SO4,MILLIGRAM/KILOMETRE             1.394
   NET SO2,GRAM/KILOMETRE                    0.000

  SULFUR BALANCE
   FUEL WT., 2412 GRAMS      SULFUR IN FUEL, .0310 PCT.
                               FUEL      SO2        H2SO4        SO2 + H2SO4
                               ----     -----      -------      -----------
              SULFUR,GRAMS      .75     0.000       .0102           .0102
              PCT. RECOVERY              0.00        1.37            1.37
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                        TABLE                        VEHICLE EMISSION RESULTS
                                              1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.          TEST NO.   8          DATE  4/19/77                        MFGR. CODE    -0                 YR.  1976
VEHICLE MODEL  CHEVY IMPALA             ENGINE   5.74 LITRE                  CURB WT.      0 KG               GVM      0 KG

BAROMETER 738.12 MM OF HG.                                              WET BULB TEMP  18.9 DEG. C
DRY BULB TEMP.    23.9 DEG. C                                            ABS. HUMIDITY  11.9 GRAMS/KG
REL. HUMIDITY      62 PCT.

EXHAUST EMISSIONS
                                                                        BLOWER INLET PRESS., G1 723.9 MM. H2O
     BLOWER DIF. PRESS., G2, 723.9 MM. H2O                              BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                          1              2              3
     BLOWER REVOLUTIONS                             40584          69956          40666
     HC    SAMPLE  METER READING/SCALE              89.3/ 2        20.4/ 2        39.5/ 2
     HC    SAMPLE  PPM                              89             20             39
     HC    BACKGRD METER READING/SCALE               9.3/ 2         9.3/ 2         8.8/ 2
     HC    BACKGRD PPM                               9              9              9
     CO    SAMPLE  METER READING/SCALE              41.9/ 3        64.2/11        31.0/ 3
     CO    SAMPLE  PPM                              1013           263            732
     CO    BACKGRD METER READING/SCALE               .2/ 3          .4/ 3         2.3/11
     CO    BACKGRD PPM                               4              9              7
     CO2   SAMPLE  METER READING/SCALE              45.2/ 2        66.0/ 3        98.5/ 3
     CO2   SAMPLE  PERCENT                          2.02           1.18           1.86
     CO2   BACKGRD METER READING/SCALE               1.9/ 2         1.9/ 2         4.4/ 3
     CO2   BACKGRD PERCENT                           .07            .07           .07
     NOX   SAMPLE  METER READING/SCALE              78.0/ 2        37.1/ 2        67.2/ 2
     NOX   SAMPLE  PPM                              78.0           37.1           67.2
     NOX   BACKGRD METER READING/SCALE               .9/ 2          .8/ 2          .9/ 2
     NOX   BACKGRD PPM                               .9             .8             .9
     SO2   SAMPLE  METER READING/SCALE              -0.0/-0        -0.0/-0        -0.0/-0
     SO2   SAMPLE  PPM                              -0.0           -0.0           -0.0
     SO2   BACKGRD METER READING/SCALE              -0.0/-0        -0.0/-0        -0.0/-0
     SO2   BACKGRD PPM                              -0.0           -0.0           -0.0

     HC    CONCENTRATION PPM                         81             12             32
     CO    CONCENTRATION PPM                        950            244            685
     CO2   CONCENTRATION PCT                        1.96           1.12           1.80
     NOX   CONCENTRATION PPM                        77.2           36.4           66.4
     SO2   CONCENTRATION PPM                         0.0            0.0            0.0
     HC    MASS GRAMS                               3.55            .90           1.39
     CO    MASS GRAMS                              83.46          36.95          60.32
     CO2   MASS GRAMS                            2717.59        2680.78        2501.92
     NOX   MASS GRAMS                              11.60           9.42          10.00
     SO2   MASS GRAMS                               0.00           0.00           0.00

     WEIGHTED MASS HC        .27 GRAMS/KILOMETRE
     WEIGHTED MASS CO       8.89 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    437.16 GRAMS/KILOMETRE
     WEIGHTED MASS NOX      1.67 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

    CARBON BALANCE FUEL CONSUMPTION = 19.26 LITRES PER HUNDRED KILOMETRES
    TOTAL CVS FLOW =    281.2 STD. CU. METRES
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      TABLE        EXHAUST EMISSIUNS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER   7

DATE  4/19/77               TIME     -0 HRS.        TEST NO.  2
MODEL  1976 CHEVY IMPALA    SET-7                   ENGINE 5.7 LITREV 8
DRIVER   SR                 TEST WT.  2177 KG.      GVW    0 KG
WET BULB TEMP  18 C         DRY BULB TEMP  24 C     REL. HUM.  55.6 PCT
SPEC. HUM.  10.9 GRAM/KG    BARO.  737.4 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION          23.27 MINUTES
  BLOWER INLET PRESS. 723.9  MM. H2O
  BLOWER DIF.  PRESS. 723.9  MM  H2O
  BLOWER INLET TEMP.      44  DEG. C
  DYNO REVOLUTIONS    32830
  BLOWER REVOLUTIONS   112088
  BLOWER CU. CM /REV.  2232

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE            24.7/2
   HC  SAMPLE  PPM                              25
   HC  BACKGRD METER READING/SCALE             8.5/2
   HC  BACKGRD PPM                               9
   CO  SAMPLE  METER READING/SCALE            23.0/3
   CO  SAMPLE  PPM                             532
   CO  BACKGRD METER READING/SCALE             2.1/*
   CO  BACKGRD PPM                               6
   CO2 SAMPLE  METER READING/SCALE            46.7/2
   CO2 SAMPLE  PERCENT                        2.10
   CO2 BACKGRD METER READING/SCALE             2.3/2
   CO2 BACKGRD PERCENT                         .08
   NOX SAMPLE  METER READING/SCALE            92.8/2
   NOX SAMPLE  PPM                            92.8
   NOX BACKGRD METER READING/SCALE             1.4/2
   NOX BACKGRD PPM                             1.4
   HC  CONCENTRATION PPM                        18
   CO  CONCENTRATION PPM                       496
   CO2 CONCENTRATION PCT                      2.03
   NOX CONCENTRATION PPM                      91.6
   SO2 COCENTRATION PPM                       0.0
   HC  MASS (GRAMS)                           2.11
   CO  MASS (GRAMS)                         120.11
   CO2 MASS (GRAMS)                        7752.97
   NOX MASS (GRAMS)                          36.71
   SO2 MASS (GRAMS)                           0.00

HC  GRAMS/KILOMETRE       .10
CO  GRAMS/KILOMETRE      5.53
CO2 GRAMS/KILOMETRE   357
NOX GRAMS/KILOMETRE      1.69
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL    .84     HC  GRAMS/MIN    .09
CO  GRAMS/KG OF FUEL   47.9     CO  GRAMS/MIN    5.2
CO2 GRAMS/KG OF FUEL   3091     CO2 GRAMS/MIN    333
NOX GRAMS/KG OF FUEL  14.64     NOX GRAMS/MIN   1.58
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   15.63 LITRES PER HUNDRED KILOMETERS
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     TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER   7

DATE  4/19/77                 TIME     -0 HRS.          TEST NO.  2
MODEL  1976 CHEVY IMPALA      SET-7                     ENGINE 5.7 LITREO
RUN DURATION   23.27 MIN.   DISTANCE DRIVEN  21.74  KILOMETRES
CVS BLOWER TEST VOL.  250.21 ACT. CU. METRES

                              SAMPLE                    BACKGROUND
SULFATE DATA                  ------                    ----------

 FILTER NO.                 47-FH-2808
 SAMPLE VOL. CU. FT.           19.79                       1.00
 SAMPLE TEMP. DEG. F           88                          70
 SAMPLE AREA SQ. IN.       49251.00                        0.00
 DILUTION FACTOR                1                          1
 STAND. DEN. MICROG/ML        20.00                        1.00
 STAND. AREA SQ. IN.      153135.00                        1.00
 SO4,MICROG/FILTER            64.324                       0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.           1.00                        1.00
 SAMPLE TEMP. DEG. F           70                          70
 AREA,BUBBLER 1                0.00                        0.00
 DIL. FACT.,BUBBLER 1          1                           1
 AREA,BUBBLER 2                0.00                        0.00
 DIL. FACT.,BUBBLER 2          1                           1
 STAND. DEN. MICROG/ML         1.00                        1.00
 STAND. AREA,SQ. IN.           1.00                        1.00
 SO2, MILLIG/BUBBLER 1         0.000                       0.000
 SO2, MILLIG/BUBBLER 2         0.000                       0.000
 SO2, PPM                      0.0                         0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST              32.312
 NET H2SO4,MILLIGRAM/TEST                32.991
 NET SO2,GRAM/TEST                        0.000
 NET SULFATE,MILLIGRAM/KILOMETRE          1.486
 NET H2SO4,MILLIGRAM/KILOMETRE            1.518
 NET SO2,GRAM/KILOMETRE                   0.000

SULFUR BALANCE
 FUEL WT., 2508 GRAMS     SULFUR IN FUEL, .0310 PCT.
                           FUEL      SO2       H2SO4        SO2 + H2SO4
                           ----     -----     -------      -----------
           SULFUR,GRAMS     .78     0.000      .0108           .0108
           PCT. RECOVERY             0.00       1.39            1.39
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                 TABLE                        VEHICLE EMISSION RESULTS
                                            1975  LIGHT DUTY EMISSIONS TEST
INIT NO.    7      TEST NO.   8         DATE  5/ 5/77                         MFGR. CODE    -0                  YR.  1976
VEHICLE MODEL  CHEVY IMPALA             ENGINE    5.74 LITRE                  CURB WT.      0 KG                GVM      0 KG

BAROMETER 737.11 MM OF HG.                                                 WET BULB TEMP  21.1 DEG. C
DRY BULB TEMP.    25.0 DEG. C                                               ABS. HUMIDITY  14.5 GRAMS/KG
REL. HUMIDITY      71 PCT.

EXHAUST EMISSIONS
                                                                           BLOWER INLET PRESS., G1 711.2 MM. H2O
    BLOWER DIF. PRESS., G2, 711.2 MM. H2O                                  BLOWER INLET TEMP.    43 DEG. C
    BAG RESULTS
    BAG NO.                                         1               2                 3
    BLOWER REVOLUTIONS                           40770            69838             40690
    HC    SAMPLE  METER READING/SCALE             50.3/ 2          18.3/ 2           26.7/ 2
    HC    SAMPLE  PPM                              50               18                27
    HC    BACKGRD METER READING/SCALE             11.1/ 2          11.8/ 2           12.4/ 2
    HC    BACKGRD PPM                              11               12                12
    CO    SAMPLE  METER READING/SCALE             28.3/12           7.2/13           56.6/13
    CO    SAMPLE  PPM                             182                7                54
    CO    BACKGRD METER READING/SCALE               .6/12            .2/12            1.2/13
    CO    BACKGRD PPM                               1                0                 1
    CO2   SAMPLE  METER READING/SCALE             42.4/ 2          65.7/ 3           89.8/ 3
    CO2   SAMPLE  PERCENT                         1.87             1.18              1.67
    CO2   BACKGRD METER READING/SCALE              1.6/ 2           1.5/ 2            4.3/ 3
    CO2   BACKGRD PERCENT                          .06              .05               .07
    NOX   SAMPLE  METER READING/SCALE             84.1/ 2          46.5/ 2           87.5/ 2
    NOX   SAMPLE  PPM                             84.1             46.5              87.5
    NOX   BACKGRD METER READING/SCALE              1.5/ 2           1.7/ 2            1.7/ 2
    NOX   BACKGRD PPM                              1.5              1.7               1.7
    SO2   SAMPLE  METER READING/SCALE             -0.0/-0          -0.0/-0           -0.0/-0
    SO2   SAMPLE  PPM                             -0.0             -0.0              -0.0
    SO2   BACKGRD METER READING/SCALE             -0.0/-0          -0.0/-0           -0.0/-0
    SO2   BACKGRD PPM                             -0.0             -0.0              -0.0

    HC    CONCENTRATION PPM                        41                8                16
    CO    CONCENTRATION PPM                       170                6                50
    CO2   CONCENTRATION PCT                       1.82             1.13              1.62
    NOX   CONCENTRATION PPM                       82.8             44.9              86.0
    SO2   CONCENTRATION PPM                        0.0              0.0               0.0
    HC    MASS GRAMS                              1.78              .57               .69
    CO    MASS GRAMS                             15.07              .95              4.41
    CO2   MASS GRAMS                           2535.39          2696.74           2252.20
    NOX   MASS GRAMS                             13.75            12.78             14.25
    SO2   MASS GRAMS                              0.00             0.00              0.00

    WEIGHTED MASS HC        .14 GRAMS/KILOMETRE
    WEIGHTED MASS CO        .82 GRAMS/KILOMETRE
    WEIGHTED MASS CO2    420.20 GRAMS/KILOMETRE
    WEIGHTED MASS NOX      2.22 GRAMS/KILOMETRE
    WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

  CARBON BALANCE FUEL CONSUMPTION = 17.99 LITRES PER HUNDRED KILOMETRES
  TOTAL CVS FLOW =    281.8 STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                           VEHICLE NUMBER   7

DATE  5/ 5/77             TIME     -0 HRS.        TEST NO.  2
MODEL  1976 CHEVY EM 7    SET 7                   ENGINE 5.7 LITREV 8
DRIVER   SR               TEST WT.  2267 KG.      GVW    0 KG
WET BULB TEMP  21 C       DRY BULB TEMP  25 C     REL. HUM.  70.9 PCT
SPEC. HUM.  14.5 GRAM/KG  BARO.  737.1 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION          23.28 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     45  DEG. C
  DYNO REVOLUTIONS    31814
  BLOWER REVOLUTIONS   112244
  BLOWER CU. CM /REV.  2239

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE          19.0/2
   HC  SAMPLE  PPM                            19
   HC  BACKGRD METER READING/SCALE          11.9/2
   HC  BACKGRD PPM                            12
   CO  SAMPLE  METER READING/SCALE          18.7/*
   CO  SAMPLE  PPM                            18
   CO  BACKGRD METER READING/SCALE            .7/*
   CO  BACKGRD PPM                             1
   CO2 SAMPLE  METER READING/SCALE          44.0/2
   CO2 SAMPLE  PERCENT                      1.95
   CO2 BACKGRD METER READING/SCALE           1.9/2
   CO2 BACKGRD PERCENT                       .07
   NOX SAMPLE  METER READING/SCALE          39.8/3
   NOX SAMPLE  PPM                         119.4
   NOX BACKGRD METER READING/SCALE            .9/3
   NOX BACKGRD PPM                           2.7
   HC  CONCENTRATION PPM                       9
   CO  CONCENTRATION PPM                      16
   CO2 CONCENTRATION PCT                    1.89
   NOX CONCENTRATION PPM                   117.1
   SO2 COCENTRATION PPM                     0.0
   HC  MASS (GRAMS)                         1.06
   CO  MASS (GRAMS)                         3.86
   CO2 MASS (GRAMS)                      7260.28
   NOX MASS (GRAMS)                        53.41
   SO2 MASS (GRAMS)                         0.00

 HC  GRAMS/KILOMETRE       .05
 CO  GRAMS/KILOMETRE       .18
 CO2 GRAMS/KILOMETRE   331
 NOX GRAMS/KILOMETRE      2.44
 SO2 GRAMS/KILOMETRE      0.00

 HC  GRAMS/KG OF FUEL    .46     HC  GRAMS/MIN    .05
 CO  GRAMS/KG OF FUEL    1.7     CO  GRAMS/MIN     .2
 CO2 GRAMS/KG OF FUEL   3165     CO2 GRAMS/MIN    312
 NOX GRAMS/KG OF FUEL  23.29     NOX GRAMS/MIN   2.29
 SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
 CARBON BALANCE FUEL ECONOMY =   14.23 LITRES PER HUNDRED KILOMETERS
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      TABLE       EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                         VEHICLE NUMBER   7

DATE  5/ 5/77              TIME    -0 HRS.        TEST NO.  2
MODEL  1976 CHEVY EM 7     SET 7                  ENGINE 5.7 LITREO
RUN DURATION   23.28 MIN.  DISTANCE DRIVEN  21.94 KILOMETRES
CVS BLOWER TEST VOL.  251.30 ACT. CU. METRES

                           SAMPLE                 BACKGROUND
SULFATE DATA               ------                 ----------

 FILTER NO.              47-FH-2809
 SAMPLE VOL. CU. FT.         13.52                      1.00
 SAMPLE TEMP. DEG. F         86                         70
 SAMPLE AREA SQ. IN.     167417.00                      0.00
 DILUTION FACTOR              5                          1
 STAND. DEN. MICROG/ML       20.00                      1.00
 STAND. AREA SQ. IN.     177450.00                      1.00
 SO4,MICROG/FILTER          943.460                     0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                      1.00
 SAMPLE TEMP. DEG. F          70                         70
 AREA,BUBBLER 1               0.00                      0.00
 DIL. FACT.,BUBBLER 1          1                          1
 AREA,BUBBLER 2               0.00                      0.00
 DIL. FACT.,BUBBLER 2          1                          1
 STAND. DEN. MICROG/ML        1.00                      1.00
 STAND. AREA,SQ. IN.          1.00                      1.00
 SO2, MILLIG/BUBBLER 1        0.000                     0.000
 SO2, MILLIG/BUBBLER 2        0.000                     0.000
 SO2, PPM                     0.0                        0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST          699.702
 NET H2SO4,MILLIGRAM/TEST            714.396
 NET SO2,GRAM/TEST                     0.000
 NET SULFATE,MILLIGRAM/KILOMETRE      31.899
 NET H2SO4,MILLIGRAM/KILOMETRE        32.569
 NET SO2,GRAM/KILOMETRE                0.000

SULFUR BALANCE
 FUEL WT., 2294 GRAMS     SULFUR IN FUEL, .0310 PCT.
                           FUEL     SO2        H2SO4       SO2 + H2SO4
                           ----    -----      -------      -----------
           SULFUR,GRAMS     .71    0.000       .2336          .2336
           PCT. RECOVERY            0.00       32.85          32.85
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              TABLE                      VEHICLE EMISSION RESULTS
                                    1975  LIGHT DUTY EMISSIONS TEST
IT NO.              TEST NO. *         DATE  5/10/77                     MFGR. CODE   -0             YR.  1976
EHICLE MODEL  CHEVY IMPALA             ENGINE   5.74 LITRE 8             CURB WT.     0 KG           GVW     0 KG

AROMETER 737.62 MM OF HG.                                             WET BULB TEMP  20.6 DEG. C
Y BULB TEMF.    27.8 DFG. C                                            ABS. HUMIDITY  12.5 GRAMS/KG
L. HUMIDITY      52 PCT.

XHAUST EMISSIONS
                                                                      BLOWER INLET PRESS., G1 647.7 MM. H2O
   BLOWER DIF. PRESS., G2, 647.7 MM. H2O                              BLOWER INLET TEMP.   43 DEG. C
   BAG RESULTS
   BAG NO.                                     1              2              3
   BLOWER REVOLUTIONS                        40794          70107          40527
   HC    SAMPLE  METER READING/SCALE          51.0/2         20.4/2         27.7/2
   HC    SAMPLE  PPM                          51             20             28
   HC    BACKGRD METER READING/SCALE          15.0/2         14.3/2         12.2/2
   HC    BACKGRD PPM                          15             14             12
   CO    SAMPLE  METER READING/SCALE          63.5/*         22.2/*         64.0/*
   CO    SAMPLE  PPM                          142            21             62
   CO    BACKGRD METER READING/SCALE           6.1/*          3.6/*          4.5/*
   CO    BACKGRD PPM                          11              6              4
   CO2   SAMPLE  METER READING/SCALE          42.8/2         62.8/3         88.5/3
   CO2   SAMPLE  PERCENT                      1.89           1.12           1.65
   CO2   BACKGRD METER READING/SCALE           1.8/2          1.8/2          4.1/3
   CO2   BACKGRD PERCENT                      .07            .07            .06
   NOX   SAMPLE  METER READING/SCALE          27.3/3         45.6/2         87.3/2
   NOX   SAMPLE  PPM                          81.9           45.6           87.3
   NOX   BACKGRD METER READING/SCALE           .4/3           .4/3           1.4/2
   NOX   BACKGRD PPM                          1.2            1.2            1.4
   SO2   SAMPLE  METER READING/SCALE          -0.0/*         -0.0/*         -0.0/*
   SO2   SAMPLE  PPM                          -0.0           -0.0           -0.0
   SO2   BACKGRD METER READING/SCALE          -0.0/*         -0.0/*         -0.0/*
   SO2   BACKGRD PPM                          -0.0           -0.0           -0.0

   HC    CONCENTRATION PPM                    38              7             17
   CO    CONCENTRATION PPM                    125            14             55
   CO2   CONCENTRATION PCT                    1.83           1.06           1.59
   NOX   CONCENTRATION PPM                    80.9           44.5           86.1
   SO2   CONCENTRATION PPM                    0.0            0.0            0.0
   HC    MASS GRAMS                           1.69           .55            .75
   CO    MASS GRAMS                           11.13          2.17           4.88
   CO2   MASS GRAMS                         2580.52        2565.07        2228.50
   NOX   MASS GRAMS                           12.59          11.91          13.31
   SO2   MASS GRAMS                           0.00           0.00           0.00

   WEIGHTED MASS HC         .14 GRAMS/KILOMETRE
   WEIGHTED MASS CO         .81 GRAMS/KILOMETRE
   WEIGHTFD MASS CO2    409.77 GRAMS/KILOMFTRE
   WEIGHTED MASS NOX      2.06 GRAMS/KILOPFTRE
   WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

 CARBON BALANCE FUEL CONSUMPTION = 17.55 LITRES PER HUNDRED KILOMETRES
 TOTAL CVS FLOW =    284.5 STD. CU. METRFS
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         TABLE          EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                                 VEHICLE NUMBER

   DATE  5/10/77                  TIME     -0 HRS.         TEST NO.  2
   MODEL  1976 CHEVY              SET-7                    ENGINE 5.7 LITRE  8
   DRIVER   SR                    TEST WT.  2267 KG.       GVW     0 KG
   WET BULB TEMP  21 C            DRY BULB TEMP  30 C      REL. HUM.  42.2 PCT
   SPEC. HUM.  11.5 GRAM/KG       BARO.  737.9 MM  HG.     MEASURED FUEL  0.00 KG

    RUN DURATION            23.28 MINUTES
    BLOWER INLET PRESS. 660.4  MM. H2O
    BLOWER DIF.  PRESS. 660.4  MM  H2O
    BLOWER INLET TEMP.     43  DEG. C
    DYNO REVOLUTIONS     31709
    BLOWER REVOLUTIONS    112483
    BLOWER CU. CM /REV.  2235

    BAG RESULTS
     HC   SAMPLE  METER READING/SCALE              27.9/2
     HC   SAMPLE  PPM                                28
     HC   BACKGRD METER READING/SCALE              15.2/2
     HC   BACKGRD PPM                                15
     CO   SAMPLE  METER READING/SCALE              19.9/*
     CO   SAMPLE  PPM                                19
     CO   BACKGRD METER READING/SCALE               3.0/*
     CO   BACKGRD PPM                                 3
     CO2 SAMPLE  METER READING/SCALE               43.0/2
     CO2 SAMPLE  PERCENT                          1.90
     CO2 BACKGRD METER READING/SCALE               2.0/2
     CO2 BACKGRD PERCENT                           .07
     NOX SAMPLE  METER READING/SCALE              36.9/3
     NOX SAMPLE  PPM                             110.7
     NOX BACKGRD METER READING/SCALE                .7/3
     NOX BACKGRD PPM                               2.1
     HC   CONCENTRATION PPM                          15
     CO   CONCENTRATION PPM                          15
     CO2 CONCENTRATION PCT                        1.84
     NOX CONCENTRATION PPM                       108.9
     SO2 COCENTRATION PPM                          0.0
     HC   MASS (GRAMS)                            1.81
     CO   MASS (GRAMS)                            3.75
     CO2 MASS (GRAMS)                          7127.39
     NOX MASS (GRAMS)                            45.18
     SO2 MASS (GRAMS)                             0.00

   HC   GRAMS/KILOMETRE       .08
   CO   GRAMS/KILOMETRE       .17
   CO2 GRAMS/KILOMETRE    326
   NOX GRAMS/KILOMETRE      2.07
   SO2 GRAMS/KILOMETRE      0.00

   HC   GRAMS/KG OF FUEL     .80      HC   GRAMS/MIN     .08
   CO   GRAMS/KG OF FUEL     1.7      CO   GRAMS/MIN      .2
   CO2 GRAMS/KG OF FUEL    3164      CO2 GRAMS/MIN     306
   NOX GRAMS/KG OF FUEL   20.06      NOX GRAMS/MIN    1.94
   SO2 GRAMS/KG OF FUEL    0.00      SO2 GRAMS/MIN    0.00
   CARBON BALANCE FUEL ECONOMY =   13.96 LITRES PER HUNDRED KILOMETERS
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER

   DATE  5/10/77               TIME    -0 HRS.         TEST NO.  2
   MODEL  1976 CHEVY           SET-7                   ENGINE 5.7 LITRES
   RUN DURATION   23.28 MIN.   DISTANCE DRIVEN  21.86 KILOMETRES
   CVS BLOWER TEST VOL.  251.37 ACT. CU. METRES

                               SAMPLE                  BACKGROUND
   SULFATE DATA                ------                  ----------

    FILTER NO.               47FH-2810
    SAMPLE VOL. CU. FT.          13.26                      1.00
    SAMPLE TEMP. DEG. F             85                        70
    SAMPLE AREA SQ. IN.     203180.00                       0.00
    DILUTION FACTOR                  5                         1
    STAND. DEN. MICROG/ML        20.00                      1.00
    STAND. AREA SQ. IN.     190837.00                       1.00
    SO4,MICROG/FILTER         1064.678                     0.000

   SULFUR DIOXIDE DATA

    SAMPLE VOL. CU. FT.           1.00                      1.00
    SAMPLE TEMP. DEG. F             70                        70
    AREA,BUBBLER 1                0.00                      0.00
    DIL. FACT.,BUBBLER 1             1                         1
    AREA,BUBBLER 2                0.00                      0.00
    DIL. FACT.,BUBBLER 2             1                         1
    STAND. DEN. MICROG/ML        20.00                     20.00
    STAND. AREA,SQ. IN.           1.00                      1.00
    SO2, MILLIG/BUBBLER 1        0.000                     0.000
    SO2, MILLIG/BUBBLER 2        0.000                     0.000
    SO2, PPM                       0.0                       0.0

   SULFATE AND SO2 EMISSIONS

    NET SULFATE,MILLIGRAM/TEST           798.106
    NET H2SO4,MILLIGRAM/TEST             814.866
    NET SO2,GRAM/TEST                      0.000
    NET SULFATE,MILLIGRAM/KILOMETRE       36.505
    NET H2SO4,MILLIGRAM/KILOMETRE         37.272
    NET SO2,GRAM/KILOMETRE                 0.000

   SULFUR BALANCE
    FUEL WT., 2253 GRAMS      SULFUR IN FUEL. .0310 PCT.
                                FUEL     SO2       H2SO4       SO2 + H2SO4
                                ----    -----     -------     -----------
              SULFUR,GRAMS       .70    0.000      .2665           .2665
              PCT. RECOVERY             0.00       38.16           38.16
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                   TABLE                    VEHICLE EMISSION RESULTS
                                        1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.    7        TEST NO. *         DATE  5/18/77                  MFGR. CODE   -0                 YR.  1976
VEHICLE MODEL  IMPALA EM 7              ENGINE   5.74 LITRE 8          CURB WT.     0 KG               GVM     0 KG

BAROMETER 739.39 MM OF HG.
DRY BULB TEMP.   22.8 DEG. C                                     WET BULB TEMP  20.6 DEG. C
REL. HUMIDITY     82 PCT.                                         ABS. HUMIDITY  14.6 GRAMS/KG

EXHAUST EMISSIONS

     BLOWER DIF. PRESS., G2, 711.2 MM. H2O                        BLOWER INLET PRESS., G1 711.2 MM. H2O
     BAG RESULTS                                                  BLOWER INLET TEMP.   43 DEG. C
     BAG NO.                                   1            2            3
     BLOWER REVOLUTIONS                      40730        69849        40621
     HC    SAMPLE  METER READING/SCALE        92.1/2       20.6/2       38.6/2
     HC    SAMPLE  PPM                        92           21           39
     HC    BACKGRD METER READING/SCALE        14.3/2       15.3/2       16.6/2
     HC    BACKGRD PPM                        14           15           17
     CO    SAMPLE  METER READING/SCALE        66.0/*       12.0/*       98.6/*
     CO    SAMPLE  PPM                        148          11           100
     CO    BACKGRD METER READING/SCALE        .4/*         .7/*         1.8/*
     CO    BACKGRD PPM                        1            1            2
     CO2   SAMPLE  METER READING/SCALE        90.9/3       57.9/3       83.7/3
     CO2   SAMPLE  PERCENT                    1.70         1.02         1.55
     CO2   BACKGRD METER READING/SCALE        2.9/3        4.1/3        3.2/3
     CO2   BACKGRD PERCENT                    .04          .06          .05
     NOX   SAMPLE  METER READING/SCALE        46.3/3       39.9/2       63.7/2
     NOX   SAMPLE  PPM                        138.9        39.9         63.7
     NOX   BACKGRD METER READING/SCALE        .5/3         .6/3         .8/2
     NOX   BACKGRD PPM                        1.5          1.8          .8
     SO2   SAMPLE  METER READING/SCALE        -0.0/*       -0.0/*       -0.0/*
     SO2   SAMPLE  PPM                        -0.0         -0.0         -0.0
     SO2   BACKGRD METER READING/SCALE        -0.0/*       -0.0/*       -0.0/*
     SO2   BACKGRD PPM                        -0.0         -0.0         -0.0

     HC    CONCENTRATION PPM                  80           6            24
     CO    CONCENTRATION PPM                  139          10           93
     CO2   CONCENTRATION PCT                  1.66         .96          1.50
     NOX   CONCENTRATION PPM                  137.6        38.2         63.0
     SO2   CONCENTRATION PPM                  0.0          0.0          0.0
     HC    MASS GRAMS                         3.49         .49          1.05
     CO    MASS GRAMS                         12.30        1.48         8.19
     CO2   MASS GRAMS                       2320.26      2310.57      2097.22
     NOX   MASS GRAMS                         23.00        10.96        10.50
     SO2   MASS GRAMS                         0.00         0.00         0.00

     WEIGHTED MASS HC        .21 GRAMS/KILOMETRE
     WEIGHTED MASS CO        .95 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    373.21 GRAMS/KILOMETRE
     WEIGHTED MASS NOX      2.22 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

   CARBON BALANCE FUEL CONSUMPTION = 16.01 LITRES PER HUNDRED KILOMETRES
   TOTAL CVS FLOW =    282.4 STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER   9

 ATE  5/18/77              TIME    -0 HRS.         TEST NO.  1
 ODEL  1976 IMPALA EM 7    SET-7                   ENGINE 5.7 LITREV 8
 RIVER   SR                TEST WT.  2267 KG.      GVW    0 KG
 ET BULB TEMP  20 C        DRY BULB TEMP  25 C     REL. HUM.  63.3 PCT
 PEC. HUM.  12.9 GRAM/KG   BARO.  739.9 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION          23.29 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS     31894
  BLOWER REVOLUTIONS   112358
  BLOWER CU. CM /REV.  2230

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE           22.1/2
   HC  SAMPLE  PPM                             22
   HC  BACKGRD METER READING/SCALE           15.4/2
   HC  BACKGRD PPM                             15
   CO  SAMPLE  METER READING/SCALE           44.7/*
   CO  SAMPLE  PPM                             42
   CO  BACKGRD METER READING/SCALE            2.6/*
   CO  BACKGRD PPM                              3
   CO2 SAMPLE  METER READING/SCALE           97.6/3
   CO2 SAMPLE  PERCENT                       1.84
   CO2 BACKGRD METER READING/SCALE            5.4/3
   CO2 BACKGRD PERCENT                        .08
   NOX SAMPLE  METER READING/SCALE           31.1/3
   NOX SAMPLE  PPM                           93.3
   NOX BACKGRD METER READING/SCALE             .4/3
   NOX BACKGRD PPM                            1.2
   HC  CONCENTRATION PPM                        9
   CO  CONCENTRATION PPM                       38
   CO2 CONCENTRATION PCT                     1.77
   NOX CONCENTRATION PPM                     92.3
   SO2 COCENTRATION PPM                      0.0
   HC  MASS (GRAMS)                          1.07
   CO  MASS (GRAMS)                          9.18
   CO2 MASS (GRAMS)                        6820.28
   NOX MASS (GRAMS)                          39.90
   SO2 MASS (GRAMS)                          0.00

 HC  GRAMS/KILOMETRE       .05
 CO  GRAMS/KILOMETRE       .42
 CO2 GRAMS/KILOMETRE   310
 NOX GRAMS/KILOMETRE      1.81
 SO2 GRAMS/KILOMETRE      0.00

 HC  GRAMS/KG OF FUEL    .50     HC  GRAMS/MIN    .05
 CO  GRAMS/KG OF FUEL    4.3     CO  GRAMS/MIN     .4
 CO2 GRAMS/KG OF FUEL   3161     CO2 GRAMS/MIN    293
 NOX GRAMS/KG OF FUEL  18.50     NOX GRAMS/MIN   1.71
 SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
 CARBON BALANCE FUEL ECONOMY =   13.29 LITRES PER HUNDRED KILOMETERS
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER   9

DATE  5/18/77               TIME    -0 HRS.          TEST NO.  1
MODEL  1976 IMPALA EM 7     SET-7                    ENGINE 5.7 LITRES
RUN DURATION   23.29 MIN.  DISTANCE DRIVEN  21.99 KILOMETRES
CVS BLOWER TEST VOL.  250.58 ACT. CU. METRES

                            SAMPLE                   BACKGROUND
SULFATE DATA                ------                   ----------

 FILTER NO.               47 FH 2812
 SAMPLE VOL. CU. FT.         14.52                        1.00
 SAMPLE TEMP. DEG. F         85                           70
 SAMPLE AREA SQ. IN.     108967.00                        0.00
 DILUTION FACTOR              1                           1
 STAND. DEN. MICROG/ML       20.00                        1.00
 STAND. AREA SQ. IN.     186667.00                        1.00
 SO4,MICROG/FILTER          116.750                       0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                        1.00
 SAMPLE TEMP. DEG. F          70                          70
 AREA,BUBBLER 1               0.00                        0.00
 DIL. FACT.,BUBBLER 1          1                          1
 AREA,BUBBLER 2               0.00                        0.00
 DIL. FACT.,BUBBLER 2          1                          1
 STAND. DEN. MICROG/ML        1.00                        1.00
 STAND. AREA,SQ. IN.          1.00                        1.00
 SO2, MILLIG/BUBBLER 1        0.000                       0.000
 SO2, MILLIG/BUBBLER 2        0.000                       0.000
 SO2, PPM                     0.0                         0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST             80.062
 NET H2SO4,MILLIGRAM/TEST               81.743
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         3.641
 NET H2SO4,MILLIGRAM/KILOMETRE           3.717
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2158 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2        H2SO4        SO2 + H2SO4
                            ----     -----      -------      -----------
           SULFUR,GRAMS      .67     0.000       .0267           .0267
           PCT. RECOVERY             0.00        4.00            4.00
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                    TABLE                     VEHICLE EMISSION RESULTS
                                          1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  952       TEST NO. 1         DATE  5/26/77               MFGR. CODE   -0             YR.  1976
VEHICLE MODEL  CHEVY IMPALA            ENGINE   5.74 LITRE 8       CURB WT.      0 KG          GVW     0 KG

BAROMETER 739.14 MM OF HG.                                         WET BULB TEMP  16.1 DEG. C
DRY BULB TEMP.   25.6 DEG. C                                        ABS. HUMIDITY   7.7 GRAMS/KG
REL. HUMIDITY     37 PCT.

EXHAUST EMISSIONS
                                                                   BLOWER INLET PRESS., G1 736.6 MM. H2O
   BLOWER DIF. PRESS., G2, 736.6 MM. H2O                           BLOWER INLET TEMP.   43 DEG. C
   BAG RESULTS
   BAG NO.                                     1              2              3
   BLOWER REVOLUTIONS                        40821          70505          40861
   HC    SAMPLE  METER READING/SCALE          76.4/2         31.9/2         40.1/2
   HC    SAMPLE  PPM                          76             32             40
   HC    BACKGRD METER READING/SCALE          20.5/2         17.2/2         15.0/2
   HC    BACKGRD PPM                          20             17             15
   CO    SAMPLE  METER READING/SCALE          65.6/*         51.9/*         62.9/*
   CO    SAMPLE  PPM                          147            49             61
   CO    BACKGRD METER READING/SCALE           .7/*           .9/*          2.0/*
   CO    BACKGRD PPM                           1              2              2
   CO2   SAMPLE  METER READING/SCALE          43.0/2         69.1/3         92.0/3
   CO2   SAMPLE  PERCENT                      1.90           1.25           1.72
   CO2   BACKGRD METER READING/SCALE           1.7/2          1.7/2          4.5/3
   CO2   BACKGRD PERCENT                       .06            .06            .07
   NOX   SAMPLE  METER READING/SCALE          46.9/3         27.4/2         45.0/2
   NOX   SAMPLE  PPM                          140.7          27.4           45.0
   NOX   BACKGRD METER READING/SCALE           .4/3           .4/3           .8/2
   NOX   BACKGRD PPM                          1.2            1.2             .8
   SO2   SAMPLE  METER READING/SCALE          -0.0/*         -0.0/*         -0.0/*
   SO2   SAMPLE  PPM                          0.0            0.0            0.0
   SO2   BACKGRD METER READING/SCALE          -0.0/*         -0.0/*         -0.0/*
   SO2   BACKGRD PPM                          0.0            0.0            0.0

   HC    CONCENTRATION PPM                    59             16             27
   CO    CONCENTRATION PPM                    139            46             56
   CO2   CONCENTRATION PCT                    1.84           1.19           1.66
   NOX   CONCENTRATION PPM                    139.7          26.3           44.3
   SO2   CONCENTRATION PPM                    0.0            0.0            0.0
   HC    MASS GRAMS                           2.58           1.23           1.19
   CO    MASS GRAMS                          12.29           7.03           4.97
   CO2   MASS GRAMS                        2576.38        2871.53        2320.58
   NOX   MASS GRAMS                          18.45           6.01           5.86
   SO2   MASS GRAMS                           0.00           0.00           0.00

   WEIGHTED MASS HC       .25 GRAMS/KILOMETRE
   WEIGHTED MASS CO      1.25 GRAMS/KILOMETRE
   WEIGHTED MASS CO2   439.37 GRAMS/KILOMETRE
   WEIGHTED MASS NOX     1.43 GRAMS/KILOMETRE
   WEIGHTED MASS SO2     0.00 GRAMS/KILOMETRE

   FUEL ECONOMY BY CARBON BALANCE =   5.3  KILOMETRE/LITRE
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER 952

DATE  5/26/77              TIME     -0 HRS.          TEST NO.  2
MODEL  1976 CHEVY IMPALA   SET-7                     ENGINE 5.7 LITREV 8
DRIVER   SR                TEST WT.  2267 KG.        GVW    0 KG
WET BULB TEMP  22 C        DRY BULB TEMP  31 C       REL. HUM.  45.6 PCT
SPEC. HUM.  12.9 GRAM/KG   BARO.  737.9 MM  HG.      MEASURED FUEL  0.00 KG

  RUN DURATION           23.29 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.      43  DEG. C
  DYNO REVOLUTIONS     31706
  BLOWER REVOLUTIONS   112314
  BLOWER CU. CM /REV.  2230

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE           25.3/2
   HC  SAMPLE  PPM                             25
   HC  BACKGRD METER READING/SCALE           12.8/2
   HC  BACKGRD PPM                             13
   CO  SAMPLE  METER READING/SCALE           84.6/*
   CO  SAMPLE  PPM                            201
   CO  BACKGRD METER READING/SCALE            1.0/*
   CO  BACKGRD PPM                              2
   CO2 SAMPLE  METER READING/SCALE           45.5/2
   CO2 SAMPLE  PERCENT                       2.03
   CO2 BACKGRD METER READING/SCALE            1.4/2
   CO2 BACKGRD PERCENT                        .05
   NOX SAMPLE  METER READING/SCALE           58.2/2
   NOX SAMPLE  PPM                           58.2
   NOX BACKGRD METER READING/SCALE             .9/2
   NOX BACKGRD PPM                             .9
   HC  CONCENTRATION PPM                       14
   CO  CONCENTRATION PPM                      189
   CO2 CONCENTRATION PCT                     1.99
   NOX CONCENTRATION PPM                     57.4
   SO2 COCENTRATION PPM                      0.0
   HC  MASS (GRAMS)                          1.75
   CO  MASS (GRAMS)                         45.96
   CO2 MASS (GRAMS)                       7656.20
   NOX MASS (GRAMS)                         24.75 .
   SO2 MASS (GRAMS)                          0.00

HC  GRAMS/KILOMETRE      .08
CO  GRAMS/KILOMETRE     2.10
CO2 GRAMS/KILOMETRE   350
NOX GRAMS/KILOMETRE     1.13
SO2 GRAMS/KILOMETRE     0.00

HC  GRAMS/KG OF FUEL    .72     HC  GRAMS/MIN    .07
CO  GRAMS/KG OF FUEL   18.8     CO  GRAMS/MIN    2.0
CO2 GRAMS/KG OF FUEL   3137     CO2 GRAMS/MIN    329
NOX GRAMS/KG OF FUEL  10.14     NOX GRAMS/MIN   1.06
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   15.12 LITRES PER HUNDRED KILOMETERS
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER 952

DATE  5/26/77                 TIME    -0 HRS.        TEST NO.  2
MODEL  1976 CHEVY IMPALA      SET-7                  ENGINE 5.7 LITREO
RUN DURATION    23.29 MIN.    DISTANCE DRIVEN  21.86 KILOMETRES
CVS BLOWER TEST VOL.   250.46 ACT. CU. METRES

                              SAMPLE                 BACKGROUND
SULFATE DATA                  ------                 ----------

 FILTER NO.                 47FH-2814
 SAMPLE VOL. CU. FT.           14.42                       1.00
 SAMPLE TEMP. DEG. F           90                          70
 SAMPLE AREA SQ. IN.        64304.00                       0.00
 DILUTION FACTOR                1                          1
 STAND. DEN. MICROG/ML          5.00                       1.00
 STAND. AREA SQ. IN.       171881.00                       1.00
 SO4,MICROG/FILTER             18.706                      0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.            1.00                       1.00
 SAMPLE TEMP. DEG. F           70                          70
 AREA,BUBBLER 1                 0.00                       0.00
 DIL. FACT.,BUBBLER 1           1                          1
 AREA,BUBBLER 2                 0.00                       0.00
 DIL. FACT.,BUBBLER 2           1                          1
 STAND. DEN. MICROG/ML          1.00                       1.00
 STAND. AREA,SQ. IN.            1.00                       1.00
 SO2, MILLIG/BUBBLER 1          0.000                      0.000
 SO2, MILLIG/BUBBLER 2          0.000                      0.000
 SO2, PPM                       0.0                        0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST              12.797
 NET H2SO4,MILLIGRAM/TEST                13.065
 NET SO2,GRAM/TEST                        0.000
 NET SULFATE,MILLIGRAM/KILOMETRE           .585
 NET H2SO4,MILLIGRAM/KILOMETRE             .598
 NET SO2,GRAM/KILOMETRE                   0.000

SULFUR BALANCE
 FUEL WT., 2440 GRAMS       SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2       H2SO4        SO2 + H2SO4
                            ----     -----     -------      -----------
           SULFUR,GRAMS      .76     0.000      .0043            .0043
           PCT. RECOVERY              0.00       .56              .56
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                         TABLE                          VEHICLE EMISSION RESULTS
                                                    1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.     7          TEST NO. 1          DATE  5/30/77                     MFGR. CODE    -0                  YR.  1976
VEHICLE MODEL  CHEVY IMPALA                 ENGINE   5.74 LITRE 8             CURB WT.      0 KG                GVM      0 KG

BAROMETER 740.66 MM OF HG.                                               WET BULB TEMP  19.4 DEG. C
DRY BULB TEMP.    25.6 DEG. C                                             ABS. HUMIDITY  11.9 GRAMS/KG
REL. HUMIDITY      57 PCT.

EXHAUST EMISSIONS
                                                                         BLOWER INLET PRESS., G1 711.2 MM. H2O
    BLOWER DIF. PRESS., G2, 711.2 MM. H2O                                BLOWER INLET TEMP.    43 DEG. C
    BAG RESULTS
    BAG NO.                                        1               2               3
    BLOWER REVOLUTIONS                           40650           69830           40579
    HC   SAMPLE  METER READING/SCALE              15.5/3          25.1/2          45.6/2
    HC   SAMPLE  PPM                              155             25              46
    HC   BACKGRD METER READING/SCALE               1.5/3           1.6/3          12.5/2
    HC   BACKGRD PPM                              15              16              13
    CO   SAMPLE  METER READING/SCALE              36.5/3          70.9/*          86.7/*
    CO   SAMPLE  PPM                              872             69              87
    CO   BACKGRD METER READING/SCALE               .7/3            .4/3           9.2/*
    CO   BACKGRD PPM                              15               9               9
    CO2  SAMPLE  METER READING/SCALE              42.2/2          67.6/3          87.3/3
    CO2  SAMPLE  PERCENT                          1.85            1.22            1.62
    CO2  BACKGRD METER READING/SCALE               1.9/2           1.9/2           4.6/3
    CO2  BACKGRD PERCENT                           .07             .07             .07
    NOX  SAMPLE  METER READING/SCALE              40.8/3          24.5/2          40.9/2
    NOX  SAMPLE  PPM                             122.4            24.5            40.9
    NOX  BACKGRD METER READING/SCALE               .7/3            .6/3           1.5/2
    NOX  BACKGRD PPM                              2.1             1.8             1.5
    SO2  SAMPLE  METER READING/SCALE              -0.0/*          -0.0/*          -0.0/*
    SO2  SAMPLE  PPM                              -0.0            -0.0            -0.0
    SO2  BACKGRD METER READING/SCALE              -0.0/*          -0.0/*          -0.0/*
    SO2  BACKGRD PPM                              -0.0            -0.0            -0.0

    HC   CONCENTRATION PPM                        142             11              35
    CO   CONCENTRATION PPM                        812             59              75
    CO2  CONCENTRATION PCT                        1.80            1.15            1.56
    NOX  CONCENTRATION PPM                       120.6            22.9            39.6
    SO2  CONCENTRATION PPM                        0.0             0.0             0.0
    HC   MASS GRAMS                               6.24             .80            1.52
    CO   MASS GRAMS                              71.96            8.92            6.61
    CO2  MASS GRAMS                            2512.36         2770.31         2177.59
    NOX  MASS GRAMS                              18.24            5.94            5.97
    SO2  MASS GRAMS                               0.00            0.00            0.00

    WEIGHTED MASS HC        .36 GRAMS/KILOMETRE
    WEIGHTED MASS CO       3.62 GRAMS/KILOMETRE
    WEIGHTED MASS CO2    421.95 GRAMS/KILOMETRE
    WEIGHTED MASS NOX      1.42 GRAMS/KILOMETRE
    WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

  CARBON BALANCE FUEL CONSUMPTION = 18.28 LITRES PER HUNDRED KILOMETRES
  TOTAL CVS FLOW =    282.7 STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER   7

   DATE  5/30/77              TIME    -0 HRS.        TEST NO.  2
   MODEL  1976 CHEVY IMPALA   SET-7                  ENGINE 5.7 LITREV 8
   DRIVER   SR                TEST WT.     0 KG.     GVW    0 KG
   WET BULB TEMP  18 C        DRY BULB TEMP  25 C    REL. HUM.  52.5 PCT
   SPEC. HUM.  10.6 GRAM/KG   BARO.  740.7 MM  HG.   MEASURED FUEL  0.00 KG

     RUN DURATION          23.28 MINUTES
     BLOWER INLET PRESS. 711.2  MM. H2O
     BLOWER DIF.  PRESS. 711.2  MM  H2O
     BLOWER INLET TEMP.     43  DEG. C
     DYNO REVOLUTIONS     31847
     BLOWER REVOLUTIONS    112263
     BLOWER CU. CM /REV.  2230

     BAG RESULTS
      HC  SAMPLE  METER READING/SCALE           24.1/2
      HC  SAMPLE  PPM                             24
      HC  BACKGRD METER READING/SCALE           13.8/2
      HC  BACKGRD PPM                             14
      CO  SAMPLE  METER READING/SCALE           54.5/*
      CO  SAMPLE  PPM                            119
      CO  BACKGRD METER READING/SCALE           12.1/*
      CO  BACKGRD PPM                             23
      CO2 SAMPLE  METER READING/SCALE           45.1/2
      CO2 SAMPLE  PERCENT                       2.01
      CO2 BACKGRD METER READING/SCALE            1.9/2
      CO2 BACKGRD PERCENT                        .07
      NOX SAMPLE  METER READING/SCALE           61.6/2
      NOX SAMPLE  PPM                           61.6
      NOX BACKGRD METER READING/SCALE            1.2/2
      NOX BACKGRD PPM                            1.2
      HC  CONCENTRATION PPM                       12
      CO  CONCENTRATION PPM                       93
      CO2 CONCENTRATION PCT                     1.95
      NOX CONCENTRATION PPM                     60.6
      SO2 COCENTRATION PPM                      0.0
      HC  MASS (GRAMS)                          1.50
      CO  MASS (GRAMS)                         22.80
      CO2 MASS (GRAMS)                       7540.53
      NOX MASS (GRAMS)                         24.28
      SO2 MASS (GRAMS)                          0.00

   HC  GRAMS/KILOMETRE      .07
   CO  GRAMS/KILOMETRE     1.04
   CO2 GRAMS/KILOMETRE   343
   NOX GRAMS/KILOMETRE     1.11
   SO2 GRAMS/KILOMETRE     0.00

   HC  GRAMS/KG OF FUEL    .63    HC  GRAMS/MIN    .06
   CO  GRAMS/KG OF FUEL    9.5    CO  GRAMS/MIN    1.0
   CO2 GRAMS/KG OF FUEL   3152    CO2 GRAMS/MIN    324
   NOX GRAMS/KG OF FUEL  10.15    NOX GRAMS/MIN   1.04
   SO2 GRAMS/KG OF FUEL   0.00    SO2 GRAMS/MIN   0.00
   CARBON BALANCE FUEL ECONOMY =   14.76 LITRES PER HUNDRED KILOMETERS
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      TABLE          EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                               VEHICLE NUMBER   7

DATE  5/30/77                TIME    -0 HRS.        TEST NO.  2
MODEL  1976 CHEVY IMPALA     SFT-7                  ENGINE 5.7 LITREO
RUN DURATION   23.28 MIN.   DISTANCE DRIVEN  21.96 KILOMETRES
CVS BLOWER TEST VOL.  250.38 ACT. CU. METRES

                             SAMPLE                 BACKGROUND
SULFATE DATA .               ------                 ----------

 FILTER NO.                47FH-2820
 SAMPLE VOL. CU. FT.          13.72                     1.00
 SAMPLE TEMP. DEG. F            81                        70
 SAMPLE AREA SQ. IN.       61016.00                     0.00
 DILUTION FACTOR                 1                         1
 STAND. DEN. MICROG/ML         5.00                     1.00
 STAND. AREA SQ. IN.     193974.00                      1.00
 SO4,MICROG/FILTER           15.728                    0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                      1.00
 SAMPLE TEMP. DEG. F            70                        70
 AREA,BUBBLER 1               0.00                      0.00
 DIL. FACT.,BUBBLER 1            1                         1
 AREA,BUBBLER 2               0.00                      0.00
 DIL. FACT.,BUBBLER 2            1                         1
 STAND. DEN. MICROG/ML        1.00                      1.00
 STAND. AREA,SQ. IN.          1.00                      1.00
 SO2, MILLIG/BUBBLER 1       0.000                     0.000
 SO2, MILLIG/BUBBLER 2       0.000                     0.000
 SO2, PPM                      0.0                       0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST              11.492
 NET H2SO4,MILLIGRAM/TEST                11.733
 NET SO2,GRAM/TEST                        0.000
 NET SULFATE,MILLIGRAM/KILOMETRE           .523
 NET H2SO4,MILLIGRAM/KILOMETRE             .534
 NET SO2,GRAM/KILOMETRE                   0.000

SULFUR BALANCE
 FUEL WT., 2392 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2       H2SO4         SO2 + H2SO4
                            ----     -----     -------       -----------
          SULFUR,GRAMS       .74     0.000      .0038             .0038
          PCT. RECOVERY               0.00        .52               .52
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                     TABLE                       VEHICLE EMISSION RESULTS
                                            1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  952         TEST NO. 1         DATE  6/ 2/77                     MFGR. CODE    -0                  YR.  1976
VEHICLE MODEL  CHEVY IMPALA              ENGINE    5.74 LITRE 8            CURB WT.      0 KG                GVM      0 KG

BAROMETER 739.39 MM OF HG.                                          WET BULB TEMP  19.4 DEG. C
DRY BULB TEMP.    22.8 DEG. C                                        ABS. HUMIDITY  13.1 GRAMS/KG
REL. HUMIDITY      73 PCT.

EXHAUST EMISSIONS
                                                                    BLOWER INLET PRESS., G1 711.2 MM. H2O
     BLOWER DIF. PRESS., G2, 711.2 MM. H2O                          BLOWER INLET TEMP.    43 DEG. C
     BAG RESULTS
     BAG NO.                                       1              2              3
     BLOWER REVOLUTIONS                          40658          69812          40735
     HC   SAMPLE  METER READING/SCALE            10.6/3         22.9/2         56.5/2
     HC   SAMPLE  PPM                             106             23             56
     HC   BACKGRD METER READING/SCALE             1.8/3          1.6/3         14.0/2
     HC   BACKGRD PPM                              18             16             14
     CO   SAMPLE  METER READING/SCALE            81.1/*          6.6/*         41.6/*
     CO   SAMPLE  PPM                             371              6             39
     CO   BACKGRD METER READING/SCALE             1.4/*          1.1/*          2.3/*
     CO   BACKGRD PPM                               4              3              2
     CO2  SAMPLE  METER READING/SCALE            42.5/2         65.3/3         83.5/3
     CO2  SAMPLE  PERCENT                        1.87           1.17           1.54
     CO2  BACKGRD METER READING/SCALE             1.5/2          1.6/2          3.0/3
     CO2  BACKGRD PERCENT                         .05            .06            .05
     NOX  SAMPLE  METER READING/SCALE            39.3/3         49.3/2         49.2/2
     NOX  SAMPLE  PPM                           117.9           49.3           49.2
     NOX  BACKGRD METER READING/SCALE              .4/3           .5/3           .8/2
     NOX  BACKGRD PPM                             1.2            1.5             .8
     SO2  SAMPLE  METER READING/SCALE           -0.0/*         -0.0/*         -0.0/*
     SO2  SAMPLE  PPM                           -0.0           -0.0           -0.0
     SO2  BACKGRD METER READING/SCALE           -0.0/*         -0.0/*         -0.0/*
     SO2  BACKGRD PPM                           -0.0           -0.0           -0.0

     HC   CONCENTRATION PPM                        91              8             44
     CO   CONCENTRATION PPM                       346              3             35
     CO2  CONCENTRATION PCT                      1.82           1.12           1.50
     NOX  CONCENTRATION PPM                     116.9           47.9           48.5
     SO2  CONCENTRATION PPM                       0.0            0.0            0.0
     HC   MASS GRAMS                             3.97            .62           1.94
     CO   MASS GRAMS                            30.58            .48           3.10
     CO2  MASS GRAMS                          2547.62        2676.19        2101.08
     NOX  MASS GRAMS                            18.42          12.97           7.66
     SO2  MASS GRAMS                             0.00           0.00           0.00

     WEIGHTED MASS HC       .28 GRAMS/KILOMETRE
     WEIGHTED MASS CO      1.28 GRAMS/KILOMETRE
     WEIGHTED MASS CO2   411.79 GRAMS/KILOMETRE
     WEIGHTED MASS NOX     2.09 GRAMS/KILOMETRE
     WEIGHTED MASS SO2     0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.7  KILOMETRE/LITRE
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      TABLE       EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                         VEHICLE NUMBER 952

 DATE  6/ 2/77              TIME    -0 HRS.       TEST NO.  2
 MODEL  1976 CHEVY IMPALA   SET-7                 ENGINE 5.7 LITREV 8
 DRIVER   SR                TEST WT.  2267 KG.    GVW    0 KG
 WET BULB TEMP  18 C        DRY BULB TEMP  24 C   REL. HUM.  52.0 PCT
 SPFC. HUM.  10.2 GRAM/KG   BARO.  739.9 MM  HG.  MEASURED FUEL  0.00 KG

  RUN DURATION          23.29 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    31629
  BLOWER REVOLUTIONS   112385
  BLOWER CU. CM /REV.  2230

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE          31.3/2
   HC   SAMPLE  PPM                            31
   HC   BACKGRD METER READING/SCALE          13.8/2
   HC   BACKGRD PPM                            14
   CO   SAMPLE  METER READING/SCALE          20.9/*
   CO   SAMPLE  PPM                            20
   CO   BACKGRD METER READING/SCALE           2.4/*
   CO   BACKGRD PPM                             2
   CO2 SAMPLE  METER READING/SCALE           44.3/2
   CO2 SAMPLE  PERCENT                       1.97
   CO2 BACKGRD METER READING/SCALE            1.7/2
   CO2 BACKGRD PERCENT                        .06
   NOX SAMPLE  METER READING/SCALE           82.2/2
   NOX SAMPLE  PPM                           82.2
   NOX BACKGRD METER READING/SCALE            1.2/2
   NOX BACKGRD PPM                            1.2
   HC  CONCENTRATION PPM                      20
   CO  CONCENTRATION PPM                      17
   CO2 CONCENTRATION PCT                     1.91
   NOX CONCENTRATION PPM                     81.2
   SO2 COCENTRATION PPM                      0.0
   HC  MASS (GRAMS)                          2.37
   CO  MASS (GRAMS)                          4.05
   CO2 MASS (GRAMS)                       7396.09
   NOX MASS (GRAMS)                         32.06
   SO2 MASS (GRAMS)                          0.00

 HC  GRAMS/KILOMETRE      .11
 CO  GRAMS/KILOMETRE      .19
 CO2 GRAMS/KILOMETRE   340
 NOX GRAMS/KILOMETRE     1.47
 SO2 GRAMS/KILOMETRE     0.00

 HC  GRAMS/KG OF FUEL   1.01     HC  GRAMS/MIN    .10
 CO  GRAMS/KG OF FUEL    1.7     CO  GRAMS/MIN     .2
 CO2 GRAMS/KG OF FUEL   3163     CO2 GRAMS/MIN    318
 NOX GRAMS/KG OF FUEL  13.71     NOX GRAMS/MIN   1.38
 SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
 CARBON BALANCE FUEL ECONOMY =   14.57 LITRES PER HUNDRED KILOMETERS
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                         VEHICLE NUMBER 952

DATE  6/ 2/77              TIME    -0 HRS.        TEST NO.  2
MODEL  1976 CHEVY IMPALA   SET-7                  ENGINE 5.7 LITRED
RUN DURATION   23.29 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  250.65 ACT. CU. METRES

                              SAMPLE                 BACKGROUND
SULFATE DATA                  ------                 ----------

 FILTER NO.                 47FH-2823
 SAMPLE VOL. CU. FT.           14.92                    1.00
 SAMPLE TEMP. DEG. F              82                      70
 SAMPLE AREA SQ. IN.       259903.00                    0.00
 DILUTION FACTOR                  10                       1
 STAND. DEN. MICROG/ML         20.00                    1.00
 STAND. AREA SQ. IN.       203708.00                    1.00
 SO4,MICROG/FILTER          2551.721                   0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.            1.00                    1.00
 SAMPLE TEMP. DEG. F              70                      70
 AREA,BUBBLER 1                 0.00                    0.00
 DIL. FACT.,BUBBLER 1              1                       1
 AREA,BUBBLER 2                 0.00                    0.00
 DIL. FACT.,BUBBLER 2              1                       1
 STAND. DEN. MICROG/ML          1.00                    1.00
 STAND. AREA,SQ. IN.            1.00                    1.00
 SO2, MILLIG/BUBBLER 1         0.000                   0.000
 SO2, MILLIG/BUBBLER 2         0.000                   0.000
 SO2, PPM                        0.0                     0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST           1713.615
 NET H2SO4,MILLIGRAM/TEST             1749.601
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE        78.832
 NET H2SO4,MILLIGRAM/KILOMETRE          80.487
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2338 GRAMS     SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2       H2SO4       SO2 + H2SO4
                            ----     -----     -------     -----------
           SULFUR,GRAMS      .72     0.000      .5721           .5721
           PCT. RECOVERY              0.00      78.94           78.94
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                         TABLE                  VEHICLE EMISSION RESULTS
                                            1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  952        TEST NO. 1          DATE  6/ 6/77                   MFGR. CODE   -0                  YR.  1976
VEHICLE MODEL  CHEVY IMPALA              ENGINE   5.74 LITRE 8           CURB WT.      0 KG               GVW      0 KG

BAROMETER 742.70 MM OF HG.                                             WET BULB TEMP  19.4 DEG. C
DRY BULB TEMP.   23.9 DEG. C                                            ABS. HUMIDITY  12.6 GRAMS/KG
REL. HUMIDITY     66 PCT.

EXHAUST EMISSIONS
                                                                       BLOWER INLET PRESS., G1 698.5 MM. H2O
    BLOWER DIF. PRESS., G2, 698.5 MM. H2O                              BLOWER INLET TEMP.   43 DEG. C
    BAG RESULTS
    BAG NO.                                         1               2               3
    BLOWER REVOLUTIONS                          40698           69879           40725
    HC   SAMPLE  METER READING/SCALE           11.3/3          26.1/2          89.5/2
    HC   SAMPLE  PPM                           113             26              89
    HC   BACKGRD METER READING/SCALE            1.9/3           1.7/3          13.6/2
    HC   BACKGRD PPM                           19              17              14
    CO   SAMPLE  METER READING/SCALE           61.7/*           8.6/*          59.9/*
    CO   SAMPLE  PPM                          249               8              57
    CO   BACKGRD METER READING/SCALE            1.9/*            .9/*           3.8/*
    CO   BACKGRD PPM                            3               3               4
    CO2  SAMPLE  METER READING/SCALE           97.4/3          65.8/3          81.1/3
    CO2  SAMPLE  PERCENT                        1.83            1.18            1.49
    CO2  BACKGRD METER READING/SCALE            3.9/3           4.3/3           4.3/3
    CO2  BACKGRD PERCENT                         .06             .07             .07
    NOX  SAMPLE  METER READING/SCALE           43.8/3          24.5/2          48.6/2
    NOX  SAMPLE  PPM                          131.4            24.5            48.6
    NOX  BACKGRD METER READING/SCALE             .3/3            .3/3            .9/2
    NOX  BACKGRD PPM                             .9              .9              .9
    SO2  SAMPLE  METER READING/SCALE           -0.0/*          -0.0/*          -0.0/*
    SO2  SAMPLE  PPM                            0.0             0.0             0.0
    SO2  BACKGRD METER READING/SCALE           -0.0/*          -0.0/*          -0.0/*
    SO2  BACKGRD PPM                            0.0             0.0             0.0

    HC   CONCENTRATION PPM                     97              11              77
    CO   CONCENTRATION PPM                    232               5              51
    CO2  CONCENTRATION PCT                      1.78            1.12            1.43
    NOX  CONCENTRATION PPM                    130.6            23.7            47.8
    SO2  CONCENTRATION PPM                      0.0             0.0             0.0
    HC   MASS GRAMS                             4.27             .80            3.42
    CO   MASS GRAMS                            20.67             .84            4.58
    CO2  MASS GRAMS                          2508.10         2703.36         2019.20
    NOX  MASS GRAMS                            20.35            6.33            7.45
    SO2  MASS GRAMS                             0.00            0.00            0.00

    WEIGHTED MASS HC        .38 GRAMS/KILOMETRE
    WEIGHTED MASS CO       1.02 GRAMS/KILOMETRE
    WEIGHTED MASS CO2    408.77 GRAMS/KILOMETRE
    WEIGHTED MASS NOX      1.60 GRAMS/KILOMETRE
    WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

    FUEL ECONOMY BY CARBON BALANCE =   5.7  KILOMETRE/LITRE
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        TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER 952

DATE  6/ 6/77                   TIME     -0 HRS.         TEST NO.  2
MODEL  1976 CHEVY IMPALA        SET-7                    ENGINE 5.7 LITREV 8
DRIVER   SR                     TEST WT.  2267 KG.       GVW     0 KG
WET BULB TEMP  19 C             DRY BULB TEMP  26 C      REL. HUM.  53.0 PCT
SPFC. HUM.  11.1 GRAM/KG        BARO.  742.4 MM  HG.     MEASURED FUEL  0.00 KG

  RUN DURATION           23.29 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.      43  DEG. C
  DYNO REVOLUTIONS     31850
  BLOWER REVOLUTIONS   112525
  BLOWER CU. CM /REV.  2231

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE            24.1/2
   HC   SAMPLE  PPM                              24
   HC   BACKGRD METER READING/SCALE            12.9/2
   HC   BACKGRD PPM                              13
   CO   SAMPLE  METER READING/SCALE            12.3/*
   CO   SAMPLE  PPM                              12
   CO   BACKGRD METER READING/SCALE             1.7/*
   CO   BACKGRD PPM                               2
   CO2  SAMPLE  METER READING/SCALE            43.9/2
   CO2  SAMPLE  PERCENT                        1.95
   CO2  BACKGRD METER READING/SCALE             1.9/2
   CO2  BACKGRD PERCENT                         .07
   NOX  SAMPLE  METER READING/SCALE            81.3/2
   NOX  SAMPLE  PPM                            81.3
   NOX  BACKGRD METER READING/SCALE             1.3/2
   NOX  BACKGRD PPM                             1.3
   HC   CONCENTRATION PPM                        13
   CO   CONCENTRATION PPM                        10
   CO2  CONCENTRATION PCT                      1.89
   NOX  CONCENTRATION PPM                      80.2
   SO2  COCENTRATION PPM                       0.0
   HC   MASS (GRAMS)                           1.59
   CO   MASS (GRAMS)                           2.36
   CO2  MASS (GRAMS)                        7325.60
   NOX  MASS (GRAMS)                          32.79
   SO2  MASS (GRAMS)                           0.00

HC   GRAMS/KILOMETRE       .07
CO   GRAMS/KILOMETRE       .11
CO2  GRAMS/KILOMETRE    337
NOX. GRAMS/KILOMETRE      1.51
SO2  GRAMS/KILOMETRE      0.00

HC   GRAMS/KG OF FUEL    .69     HC   GRAMS/MIN     .07
CO   GRAMS/KG OF FUEL    1.0     CO   GRAMS/MIN      .1
CO2  GRAMS/KG OF FUEL   3166     CO2  GRAMS/MIN    314
NOX  GRAMS/KG OF FUEL  14.17     NOX  GRAMS/MIN    1.41
SO2  GRAMS/KG OF FUEL   0.00     SO2  GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =   14.42 LITRES PER HUNDRED KILOMETERS
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER 952

DATE  6/ 6/77                  TIME     -0 HRS.         TEST NO.  2
MODEL  1976 CHEVY IMPALA   SET-7                        ENGINE 5.7 LITREO
RUN DURATION   23.29 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  251.00 ACT. CU. METRES

                                SAMPLE                   BACKGROUND
SULFATE DATA                    ------                   ----------

 FILTER NO.                 47FH-2826
 SAMPLE VOL. CU. FT.            13.14                         1.00
 SAMPLE TEMP. DEG. F               82                           70
 SAMPLE AREA SQ. IN.      178310.00                           0.00
 DILUTION FACTOR                   10                            1
 STAND. DEN. MICROG/ML          20.00                         1.00
 STAND. AREA SQ. IN.      205157.00                           1.00
 SO4,MICROG/FILTER           1738.278                        0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.             1.00                         1.00
 SAMPLE TEMP. DEG. F               70                           70
 AREA,BUBBLER 1                  0.00                         0.00
 DIL. FACT.,BUBBLER 1               1                            1
 AREA,BUBBLER 2                  0.00                         0.00
 DIL. FACT.,BUBBLER 2               1                            1
 STAND. DEN. MICROG/ML           1.00                         1.00
 STAND. AREA,SQ. IN.             1.00                         1.00
 SO2, MILLIG/BUBBLER 1          0.000                        0.000
 SO2, MILLIG/BUBBLER 2          0.000                        0.000
 SO2, PPM                         0.0                          0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST            1326.233
 NET H2SO4,MILLIGRAM/TEST              1354.084
 NET SO2,GRAM/TEST                        0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         61.011
 NET H2SO4,MILLIGRAM/KILOMETRE           62.292
 NET SO2,GRAM/KILOMETRE                   0.000

SULFUR BALANCE
 FUEL WT., 2314 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2      H2SO4       SO2 + H2SO4
                            ----     -----    -------     -----------
          SULFUR,GRAMS       .72     0.000      .4428          .4428
          PCT. RECOVERY              0.00      61.72          61.72
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APPENDIX C

COMPUTER PRINTOUTS
FOR
HIGH TEMPERATURE EXHAUST SYSTEM
DEVELOPMENT TESTS ON A 1975 CHEVROLET NOVA
(Tests in Chronological Order)

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                    TABLE                    VEHICLE EMISSION RESULTS
                                        1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.     9         TEST NO. *       DATE  5/13/77                        MFGR. CODE   -0                YR.  1975
VEHICLE MODEL  NOVA CHEVROLET           ENGINE   5.74 LITRE                  CURB WT.     0 KG              GVM     0 KG

BAROMETER 741.17 MM OF HG.                                           WET BULB TEMP  20.6 DEG. C
DRY BULB TEMP.    25.6 DEG. C                                         ABS. HUMIDITY  13.4 GRAMS/KG
REL. HUMIDITY      64 PCT.

EXHAUST EMISSIONS
                                                                     BLOWER INLET PRESS., G1 711.2 MM. H2O
    BLOWER DIF. PRESS., G2, 711.2 MM. H2O                            BLOWER INLET TEMP.   42 DEG. C
    BAG RESULTS
    BAG NO.                                        1              2              3
    BLOWER REVOLUTIONS                           40633          69767          40724
    HC   SAMPLE  METER READING/SCALE             10.6/3         20.5/2         35.2/2
    HC   SAMPLE  PPM                              106             20             35
    HC   BACKGRD METER READING/SCALE             1.4/3          1.3/3          27.1/2
    HC   BACKGRD PPM                               14             13             27
    CO   SAMPLE  METER READING/SCALE             73.8/*         29.4/*         44.8/*
    CO   SAMPLE  PPM                              321             27             42
    CO   BACKGRD METER READING/SCALE              .5/*           .3/*           .7/*
    CO   BACKGRD PPM                               1              1              1
    CO2  SAMPLE  METER READING/SCALE             41.9/2         27.1/2         36.7/2
    CO2  SAMPLE  PERCENT                         1.84           1.11           1.57
    CO2  BACKGRD METER READING/SCALE             1.7/2          1.3/2          1.6/2
    CO2  BACKGRD PERCENT                          .06            .05            .06
    NOX  SAMPLE  METER READING/SCALE             52.7/2         12.1/2         28.6/2
    NOX  SAMPLE  PPM                             52.7           12.1           28.6
    NOX  BACKGRD METER READING/SCALE              .7/2           .7/2           .6/2
    NOX  BACKGRD PPM                              .7             .7             .6
    SO2  SAMPLE  METER READING/SCALE            -0.0/*         -0.0/*         -0.0/*
    SO2  SAMPLE  PPM                            -0.0           -0.0           -0.0
    SO2  BACKGRD METER READING/SCALE            -0.0/*         -0.0/*         -0.0/*
    SO2  BACKGRD PPM                            -0.0           -0.0           -0.0

    HC   CONCENTRATION PPM                         94              9             11
    CO   CONCENTRATION PPM                        302             25             39
    CO2  CONCENTRATION PCT                       1.79           1.06           1.52
    NOX  CONCENTRATION PPM                       52.1           11.5           28.1
    SO2  CONCENTRATION PPM                        0.0            0.0            0.0
    HC   MASS GRAMS                              4.13            .65            .50
    CO   MASS GRAMS                             26.77           3.88           3.50
    CO2  MASS GRAMS                           2501.84        2558.33        2133.37
    NOX  MASS GRAMS                              8.32           3.14           4.49
    SO2  MASS GRAMS                              0.00           0.00           0.00

    WEIGHTED MASS HC        .22 GRAMS/KILOMETRE
    WEIGHTED MASS CO       1.44 GRAMS/KILOMETRE
    WEIGHTED MASS CO2    401.92 GRAMS/KILOMETRE
    WEIGHTED MASS NOX       .77 GRAMS/KILOMETRE
    WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

  CARBON BALANCE FUEL CONSUMPTION = 17.26 LITRES PER HUNDRED KILOMETRES
  TOTAL CVS FLOW =    283.3 STD. CU. METRES
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER   9

DATE  5/13/77               TIME     -0 HRS.        TEST NO.  2
MODEL  1975 NOVA CHEVY      SET-7                   ENGINE 5.7 LITREV 8
DRIVER   SR                 TEST WT.  1814 KG.      GVW    0 KG
WET BULB TEMP  19 C         DRY BULB TEMP  27 C     REL. HUM.  48.2 PCT
SPEC. HUM.  11.1 GRAM/KG    BARO.  741.2 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION           23.32 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     42  DEG. C
  DYNO REVOLUTIONS     31603
  BLOWER REVOLUTIONS    112380
  BLOWER CU. CM /REV.  2228

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE              35.5/2
   HC  SAMPLE  PPM                                35
   HC  BACKGRD METER READING/SCALE              34.5/2
   HC  BACKGRD PPM                                34
   CO  SAMPLE  METER READING/SCALE              24.1/*
   CO  SAMPLE  PPM                                23
   CO  BACKGRD METER READING/SCALE               1.2/*
   CO  BACKGRD PPM                                 1
   CO2 SAMPLE  METER READING/SCALE              43.0/2
   CO2 SAMPLE  PERCENT                          1.90
   CO2 BACKGRD METER READING/SCALE               1.8/2
   CO2 BACKGRD PERCENT                           .07
   NOX SAMPLE  METER READING/SCALE              43.9/2
   NOX SAMPLE  PPM                              43.9
   NOX BACKGRD METER READING/SCALE                .7/2
   NOX BACKGRD PPM                                .7
   HC  CONCENTRATION PPM                           6
   CO  CONCENTRATION PPM                          20
   CO2 CONCENTRATION PCT                        1.84
   NOX CONCENTRATION PPM                        43.3
   SO2 COCENTRATION PPM                         0.0
   HC  MASS (GRAMS)                              .72
   CO  MASS (GRAMS)                             4.99
   CO2 MASS (GRAMS)                          7133.22
   NOX MASS (GRAMS)                            17.69
   SO2 MASS (GRAMS)                             0.00

HC  GRAMS/KILOMETRE       .03
CO  GRAMS/KILOMETRE       .23
CO2 GRAMS/KILOMETRE   328
NOX GRAMS/KILOMETRE       .81
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL     .32     HC  GRAMS/MIN     .03
CO  GRAMS/KG OF FUEL     2.2     CO  GRAMS/MIN      .2
CO2 GRAMS/KG OF FUEL    3165     CO2 GRAMS/MIN     306
NOX GRAMS/KG OF FUEL    7.85     NOX GRAMS/MIN     .76
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =    14.05 LITRES PER HUNDRED KILOMETERS
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     TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                           VEHICLE NUMBER   9

DATE  5/13/77               TIME    -0 HRS.          TEST NO.  2
MODEL  1975 NOVA CHEVY      SET-7                    ENGINE 5.7 LITRES
RUN DURATION   23.32 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  250.44 ACT. CU. METRES

                             SAMPLE                BACKGROUND
SULFATE DATA                 ------                ----------

 FILTER NO.                47FH-2811
 SAMPLE VOL. CU. FT.          19.49                    1.00
 SAMPLE TEMP. DEG. F             83                      70
 SAMPLE AREA SQ. IN.      208915.00                    0.00
 DILUTION FACTOR                  1                       1
 STAND. DEN. MICROG/ML        20.00                    1.00
 STAND. AREA SQ. IN.      189916.00                    1.00
 SO4,MICROG/FILTER          220.008                   0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.           1.00                    1.00
 SAMPLE TEMP. DEG. F             70                      70
 AREA,BUBBLER 1                0.00                    0.00
 DIL. FACT.,BUBBLER 1             1                       1
 AREA,BUBBLER 2                0.00                    0.00
 DIL. FACT.,BUBBLER 2             1                       1
 STAND. DEN. MICROG/ML         1.00                    1.00
 STAND. AREA,SQ. IN.           1.00                    1.00
 SO2, MILLIG/BUBBLER 1        0.000                   0.000
 SO2, MILLIG/BUBBLER 2        0.000                   0.000
 SO2, PPM                       0.0                     0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST              151.398
 NET H2SO4,MILLIGRAM/TEST                154.578
 NET SO2,GRAM/TEST                         0.000
 NET SULFATE,MILLIGRAM/KILOMETRE           6.965
 NET H2SO4,MILLIGRAM/KILOMETRE             7.111
 NET SO2,GRAM/KILOMETRE                    0.000

SULFUR BALANCE
 FUEL WT., 2254 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2       H2SO4        SO2 + H2SO4
                            ----     -----     -------       -----------
              SULFUR,GRAMS   .70     0.000       .0505             .0505
              PCT. RECOVERY           0.00        7.23              7.23
```

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                         TABLE                  VEHICLE EMISSION RESULTS
                                             1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.    9        TEST NO. *         DATE  6/10/77                   MFGR. CODE   -0                     YR.  1975
VEHICLE MODEL  NOVA CHEVY               ENGINE   5.74 LITRE 8           CURB WT.     0 KG                   GVM     0 KG

BAROMETER 741.93 MM OF HG.                                     WET BULB TEMP  18.9 DEG. C
DRY BULB TEMP.    23.3 DEG. C                                   ABS. HUMIDITY  12.1 GRAMS/KG
REL. HUMIDITY      66 PCT.

EXHAUST EMISSIONS
                                                               BLOWER INLET PRESS., G1 685.8 MM. H2O
     BLOWER DIF. PRESS., G2, 685.8 MM. H2O                     BLOWER INLET TEMP.    43 DEG. C
     BAG RESULTS
     BAG NO.                                      1              2              3
     BLOWER REVOLUTIONS                         40664          69681          40676
     HC    SAMPLE  METER READING/SCALE           16.5/3         21.9/2         53.2/2
     HC    SAMPLE  PPM                           165            22             53
     HC    BACKGRD METER READING/SCALE            1.8/3          1.8/3         22.1/2
     HC    BACKGRD PPM                            18             18             22
     CO    SAMPLE  METER READING/SCALE           75.8/*         43.6/*         51.4/*
     CO    SAMPLE  PPM                           334            41             111
     CO    BACKGRD METER READING/SCALE            4.5/*          4.1/*         11.8/*
     CO    BACKGRD PPM                            13             12             11
     CO2   SAMPLE  METER READING/SCALE           45.2/2         66.6/3         92.8/3
     CO2   SAMPLE  PERCENT                       2.02           1.20           1.74
     CO2   BACKGRD METER READING/SCALE            2.1/2          1.8/2          3.6/3
     CO2   BACKGRD PERCENT                        .08            .07            .06
     NOX   SAMPLE  METER READING/SCALE           63.0/2         12.9/2         23.5/2
     NOX   SAMPLE  PPM                           63.0           12.9           23.5
     NOX   BACKGRD METER READING/SCALE            .8/2           .7/2           .5/2
     NOX   BACKGRD PPM                            .9             .7             .5
     SO2   SAMPLE  METER READING/SCALE           -0.0/*         -0.0/*         -0.0/*
     SO2   SAMPLE  PPM                           -0.0           -0.0           -0.0
     SO2   BACKGRD METER READING/SCALE           -0.0/*         -0.0/*         -0.0/*
     SO2   BACKGRD PPM                           -0.0           -0.0           -0.0

     HC    CONCENTRATION PPM                      150              6             34
     CO    CONCENTRATION PPM                      303             28             95
     CO2   CONCENTRATION PCT                      1.95           1.14           1.69
     NOX   CONCENTRATION PPM                      62.3           12.3           23.1
     SO2   CONCENTRATION PPM                      0.0            0.0            0.0
     HC    MASS GRAMS                             6.61            .42           1.50
     CO    MASS GRAMS                            27.01           4.31           8.51
     CO2   MASS GRAMS                          2746.09        2738.75        2377.40
     NOX   MASS GRAMS                             9.55           3.22           3.53
     SO2   MASS GRAMS                             0.00           0.00           0.00

     WEIGHTED MASS HC         .34 GRAMS/KILOMETRE
     WEIGHTED MASS CO        1.72 GRAMS/KILOMETRE
     WEIGHTED MASS CO2     437.10 GRAMS/KILOMETRE
     WEIGHTED MASS NOX        .77 GRAMS/KILOMETRE
     WEIGHTED MASS SO2       0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.3  KILOMETRE/LITRE
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER   9

DATE  6/10/77                   TIME    -0 HRS.          TEST NO.  2
MODEL  1975 NOVA CHEVY EM-9SET-7                         ENGINE 5.7 LITREV 8
DRIVER   BP                     TEST WT.  1814 KG.       GVW    0 KG
WET BULB TEMP  18 C             DRY BULB TEMP  26 C      REL. HUM.  49.6 PCT
SPEC. HUM.  10.4 GRAM/KG        BARO.  742.9 MM  HG.     MEASURED FUEL  0.00 KG

  RUN DURATION          23.27 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H20
  BLOWER DIF.  PRESS. 711.2  MM  H20
  BLOWER INLET TEMP.      43  DEG. C
  DYNO REVOLUTIONS        -0
  BLOWER REVOLUTIONS   112406
  BLOWER CU. CM /REV.  2232

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE             78.9/2
   HC  SAMPLE  PPM                               79
   HC  BACKGRD METER READING/SCALE             49.1/2
   HC  BACKGRD PPM                               49
   CO  SAMPLE  METER READING/SCALE             77.3/*
   CO  SAMPLE  PPM                              345
   CO  BACKGRD METER READING/SCALE              3.1/*
   CO  BACKGRD PPM                                9
   CO2 SAMPLE  METER READING/SCALE             49.5/2
   CO2 SAMPLE  PERCENT                         2.25
   CO2 BACKGRD METER READING/SCALE              1.7/2
   CO2 BACKGRD PERCENT                          .06
   NOX SAMPLE  METER READING/SCALE             25.3/2
   NOX SAMPLE  PPM                             25.3
   NOX BACKGRD METER READING/SCALE               .8/2
   NOX BACKGRD PPM                               .8
   HC  CONCENTRATION PPM                         38
   CO  CONCENTRATION PPM                        317
   CO2 CONCENTRATION PCT                       2.20
   NOX CONCENTRATION PPM                       24.6
   SO2 COCENTRATION PPM                         0.0
   HC  MASS (GRAMS)                            4.65
   CO  MASS (GRAMS)                           77.71
   CO2 MASS (GRAMS)                         8542.10
   NOX MASS (GRAMS)                            9.82
   SO2 MASS (GRAMS)                            0.00

HC  GRAMS/KILOMETRE       .21
CO  GRAMS/KILOMETRE      3.57
CO2 GRAMS/KILOMETRE    393
NOX GRAMS/KILOMETRE       .45
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL   1.70     HC  GRAMS/MIN    .20
CO  GRAMS/KG OF FUEL   28.4     CO  GRAMS/MIN    3.3
CO2 GRAMS/KG OF FUEL   3119     CO2 GRAMS/MIN    367
NOX GRAMS/KG OF FUEL   3.59     NOX GRAMS/MIN    .42
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   17.06 LITRES PER HUNDRED KILOMETERS
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER   9

DATE  6/10/77                TIME    -0 HRS.         TEST NO.  2
MODEL  1975 NOVA CHEVY FM-9SET-7                     ENGINE 5.7 LITREO
RUN DURATION   23.27 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  250.93 ACT. CU. METRES

                             SAMPLE                  BACKGROUND
SULFATE DATA                 ------                  ----------

 FILTER NO.                47FH-2828
 SAMPLE VOL. CU. FT.         14.01                      1.00
 SAMPLE TEMP. DEG. F           81                         70
 SAMPLE AREA SQ. IN.    128899.00                       0.00
 DILUTION FACTOR                5                          1
 STAND. DEN. MICROG/ML      20.00                       1.00
 STAND. AREA SQ. IN.    299656.00                       1.00
 SO4,MICROG/FILTER        430.157                      0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.         1.00                       1.00
 SAMPLE TEMP. DEG. F           70                         70
 AREA,BUBBLER 1              0.00                       0.00
 DIL. FACT.,BUBBLER 1           1                          1
 AREA,BUBBLER 2              0.00                       0.00
 DIL. FACT.,BUBBLER 2           1                          1
 STAND. DEN. MICROG/ML       1.00                       1.00
 STAND. AREA,SQ. IN.         1.00                       1.00
 SO2, MILLIG/BUBBLER 1      0.000                      0.000
 SO2, MILLIG/BUBBLER 2      0.000                      0.000
 SO2, PPM                     0.0                        0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST          308.851
 NET H2SO4,MILLIGRAM/TEST            315.337
 NET SO2,GRAM/TEST                     0.000
 NET SULFATE,MILLIGRAM/KILOMETRE      14.208
 NET H2SO4,MILLIGRAM/KILOMETRE        14.507
 NET SO2,GRAM/KILOMETRE                0.000

SULFUR BALANCE
 FUEL WT., 2738 GRAMS     SULFUR IN FUEL, .0310 PCT.
                            FUEL       SO2       H2SO4      SO2 + H2SO4
                            ----      -----     -------     -----------
            SULFUR,GRAMS     .85      0.000      .1031          .1031
            PCT. RECOVERY             0.00       12.15          12.15
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                         TABLE                      VEHICLE EMISSION RESULTS
                                               1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.     9         TEST NO. 1          DATE  6/28/77                       MFGR. CODE    -0                      YR.  1975
VEHICLE MODEL  CHEVY NOVA                  ENGINE    5.74 LITRE 8              CURB WT.      0 KG                    GVM      0 KG

BAROMETER 734.90 MM OF HG.                                                  WET BULB TEMP  16.7 DEG. C
DRY BULB TEMP.    22.2 DEG. C                                                ABS. HUMIDITY    9.8 GRAMS/KG
REL. HUMIDITY      57 PCT.

EXHAUST EMISSIONS
                                                                            BLOWER INLET PRESS., 61 711.2 MM. H2O
     BLOWER DIF. PRESS., G2, 711.2 MM. H2O                                  BLOWER INLET TEMP.    42 DEG. C
     BAG RESULTS
     BAG NO.                                          1              2               3
     BLOWER REVOLUTIONS                             40632          69678           40646
     HC    SAMPLE  METER READING/SCALE              76.8/2         20.5/2          25.2/2
     HC    SAMPLE  PPM                              77             20              25
     HC    BACKGRD METER READING/SCALE              12.7/2         12.7/2          12.8/2
     HC    BACKGRD PPM                              13             13              13
     CO    SAMPLE  METER READING/SCALE              86.1/*         36.3/*          63.0/*
     CO    SAMPLE  PPM                              206            34              61
     CO    BACKGRD METER READING/SCALE               .5/*           .3/*            .8/*
     CO    BACKGRD PPM                              1              1               1
     CO2   SAMPLE  METER READING/SCALE              43.8/2         62.5/3          85.8/3
     CO2   SAMPLE  PERCENT                          1.94           1.11            1.59
     CO2   BACKGRD METER READING/SCALE               1.8/2          1.7/2           3.5/3
     CO2   BACKGRD PERCENT                          .07            .06             .05
     NOX   SAMPLE  METER READING/SCALE              67.1/2         12.4/2          30.7/2
     NOX   SAMPLE  PPM                              67.1           12.4            30.7
     NOX   BACKGRD METER READING/SCALE               .9/2           .9/2            .6/2
     NOX   BACKGRD PPM                              .9             .9              .6
     SO2   SAMPLE  METER READING/SCALE             -0.0/*         -0.0/*          -0.0/*
     SO2   SAMPLE  PPM                              0.0            0.0             0.0
     SO2   BACKGRD METER READING/SCALE             -0.0/*         -0.0/*          -0.0/*
     SO2   BACKGRD PPM                              0.0            0.0             0.0

     HC    CONCENTRATION PPM                        66             9               14
     CO    CONCENTRATION PPM                        193            32              57
     CO2   CONCENTRATION PCT                        1.88           1.06            1.54
     NOX   CONCENTRATION PPM                        66.3           11.6            30.2
     SO2   CONCENTRATION PPM                        0.0            0.0             0.0
     HC    MASS GRAMS                               2.89           .67             .61
     CO    MASS GRAMS                               17.12          4.87            5.05
     CO2   MASS GRAMS                             2634.63        2532.40         2157.93
     NOX   MASS GRAMS                               9.35           2.80            4.26
     SO2   MASS GRAMS                               0.00           0.00            0.00

     WEIGHTED MASS HC        .19 GRAMS/KILOMETRE
     WEIGHTED MASS CO       1.25 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    405.66 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .77 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.7  KILOMETRE/LITRE
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           TABLE        EXHAUST EMISSIONS FROM THREE HAG  SAMPLE
                             VEHICLE NUMBER   9

DATE 28/ 6/77              TIME      1 HRS.          TEST NO.  1
MODEL  1975 CHEVY NOVA                               ENGINE 5.7 LITRED
RUN DURATION   62.60 MIN.  DISTANCE DRIVEN  17.84 KILOMETRES
CVS BLOWER TEST VOL.  336.41 ACT. CU. METRES

                               SAMPLE                  BACKGROUND
SULFATE DATA                   ------                  ----------

 FILTER NO.                  47-FH-2846
 SAMPLE VOL. CU. FT.            18.22                       1.00
 SAMPLE TEMP. DEG. F              76                          70
 SAMPLE AREA SQ. IN.          73136.00                      0.00
 DILUTION FACTOR              [illegible]                      1
 STAND. DEN. MICROG/ML          20.00                       1.00
 STAND. AREA SQ. IN.         205171.00                      1.00
 SO4,MICROG/FILTER              71.293                     0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.             1.00                       1.00
 SAMPLE TEMP. DEG. F              70                          70
 AREA,BUBBLER 1                  0.00                       0.00
 DIL. FACT.,BUBBLER 1               1                          1
 AREA,BUBBLER 2                  0.00                       0.00
 DIL. FACT.,BUBBLER 2               1                          1
 STAND. DEN. MICROG/ML           1.00                       1.00
 STAND. AREA,SQ. IN.             1.00                       1.00
 SO2, MILLIG/BUBBLER 1          0.000                      0.000
 SO2, MILLIG/BUBBLER 2          0.000                      0.000
 SO2, PPM                         0.0                        0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST               53.095
 NET H2SO4,MILLIGRAM/TEST                 54.210
 NET SO2,GRAM/TEST                         0.000
 NET SULFATE,MILLIGRAM/KILOMETRE           2.976
 NET H2SO4,MILLIGRAM/KILOMETRE             3.038
 NET SO2,GRAM/KILOMETRE                    0.000

SULFUR BALANCE
 FUEL WT., 2327 GRAMS     SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2       H2SO4       SO2 + H2SO4
                            ----     -----     -------     -----------
           SULFUR,GRAMS      .72     0.000      .0177          .0177
           PCT. RECOVERY             0.00       2.46           2.46
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER   9

DATE  6/28/77              TIME     -0 HRS.        TEST NO.  2
MODEL  1975 CHEVY NOVA     SET-7                   ENGINE 5.7 LITREV 8
DRIVER   SR                TEST WT.      0 KG.     GVW    0 KG
WET BULB TEMP  17 C        DRY BULB TEMP  23 C     REL. HUM.  54.4 PCT
SPEC. HUM.  10.0 GRAM/KG   BARO.  739.1 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION         23.33 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    31099
  BLOWER REVOLUTIONS   115942
  BLOWER CU. CM /REV.  2234

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE            18.4/2
   HC   SAMPLE  PPM                              18
   HC   BACKGRD METER READING/SCALE            11.4/2
   HC   BACKGRD PPM                              11
   CO   SAMPLE  METER READING/SCALE            20.2/*
   CO   SAMPLE  PPM                              19
   CO   BACKGRD METER READING/SCALE              .8/*
   CO   BACKGRD PPM                               1
   CO2 SAMPLE  METER READING/SCALE             97.8/3
   CO2 SAMPLE  PERCENT                         1.84
   CO2 BACKGRD METER READING/SCALE              4.9/3
   CO2 BACKGRD PERCENT                          .08
   NOX SAMPLE  METER READING/SCALE             41.6/2
   NOX SAMPLE  PPM                             41.6
   NOX BACKGRD METER READING/SCALE              2.9/2
   NOX BACKGRD PPM                              2.9
   HC   CONCENTRATION PPM                        9
   CO   CONCENTRATION PPM                       17
   CO2 CONCENTRATION PCT                       1.78
   NOX CONCENTRATION PPM                       39.1
   SO2 COCENTRATION PPM                        0.0
   HC   MASS (GRAMS)                           1.07
   CO   MASS (GRAMS)                           4.36
   CO2 MASS (GRAMS)                         7084.23
   NOX MASS (GRAMS)                           15.83
   SO2 MASS (GRAMS)                            0.00

HC  GRAMS/KILOMETRE       .05
CO  GRAMS/KILOMETRE       .20
CO2 GRAMS/KILOMETRE    326
NOX GRAMS/KILOMETRE       .73
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL     .48     HC  GRAMS/MIN     .05
CO  GRAMS/KG OF FUEL     1.9     CO  GRAMS/MIN      .2
CO2 GRAMS/KG OF FUEL    3165     CO2 GRAMS/MIN     304
NOX GRAMS/KG OF FUEL    7.07     NOX GRAMS/MIN     .68
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =    13.95 LITRES PER HUNDRED KILOMETERS
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER   9

DATE  6/28/77              TIME    -0 HRS.        TEST NO.  2
MODEL  1975 CHEVY NOVA     SET-7                  ENGINE 5.7 LITREO
RUN DURATION   23.33 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  258.96 ACT. CU. METRES

                           SAMPLE                 BACKGROUND
SULFATE DATA               ------                 ----------

 FILTER NO.              47FH-2847
 SAMPLE VOL. CU. FT.         14.39                      1.00
 SAMPLE TEMP. DEG. F            80                        70
 SAMPLE AREA SQ. IN.   360640.00                        0.00
 DILUTION FACTOR                 1                         1
 STAND. DEN. MICROG/ML       20.00                      1.00
 STAND. AREA SQ. IN.   212215.00                        1.00
 SO4,MICROG/FILTER         339.882                     0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                      1.00
 SAMPLE TEMP. DEG. F            70                        70
 AREA,BUBBLER 1               0.00                      0.00
 DIL. FACT.,BUBBLER 1            1                         1
 AREA,BUBBLER 2               0.00                      0.00
 DIL. FACT.,BUBBLER 2            1                         1
 STAND. DEN. MICROG/ML        1.00                      1.00
 STAND. AREA,SQ. IN.          1.00                      1.00
 SO2, MILLIG/BUBBLER 1       0.000                     0.000
 SO2, MILLIG/BUBBLER 2       0.000                     0.000
 SO2, PPM                      0.0                       0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST             245.279
 NET H2SO4,MILLIGRAM/TEST               250.430
 NET SO2,GRAM/TEST                        0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         11.284
 NET H2SO4,MILLIGRAM/KILOMETRE           11.521
 NET SO2,GRAM/KILOMETRE                   0.000

SULFUR BALANCE
 FUEL WT., 2238 GRAMS     SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2        H2SO4       SO2 + H2SO4
                            ----     -----      -------      -----------
            SULFUR,GRAMS     .69     0.000        .0819            .0819
            PCT. RECOVERY             0.00        11.80            11.80
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                               VEHICLE NUMBER    9

DATE  6/28/77                  TIME     -0 HRS.         TEST NO.  3
MODEL  1975 NOVA CHEVY         FET                      ENGINE 5.7 LITREV 8
DRIVER   SR                    TEST WT.      0 KG.      GVW    0 KG
WET BULB TEMP  18 C            DRY BULB TEMP  25 C      REL. HUM.  49.1 PCT
SPEC. HUM.  10.0 GRAM/KG       BARO.  738.6 MM  HG.     MEASURED FUEL  0.00 KG

  RUN DURATION          12.75 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H20
  BLOWER DIF.  PRESS. 711.2  MM  H20
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    23405
  BLOWER REVOLUTIONS    61663
  BLOWER CU. CM /REV.  2230

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE             19.9/2
   HC   SAMPLE  PPM                                20
   HC   BACKGRD METER READING/SCALE             10.8/2
   HC   BACKGRD PPM                                11
   CO   SAMPLE  METER READING/SCALE             18.7/*
   CO   SAMPLE  PPM                                18
   CO   BACKGRD METER READING/SCALE              1.1/*
   CO   BACKGRD PPM                                 1
   CO2 SAMPLE  METER READING/SCALE             51.1/2
   CO2 SAMPLE  PERCENT                         2.34
   CO2 BACKGRD METER READING/SCALE              1.7/2
   CO2 BACKGRD PERCENT                          .06
   NOX SAMPLE  METER READING/SCALE             61.7/2
   NOX SAMPLE  PPM                             61.7
   NOX BACKGRD METER READING/SCALE              1.9/2
   NOX BACKGRD PPM                              1.9
   HC   CONCENTRATION PPM                         11
   CO   CONCENTRATION PPM                         16
   CO2 CONCENTRATION PCT                       2.29
   NOX CONCENTRATION PPM                       60.1
   SO2 COCENTRATION PPM                        0.0
   HC   MASS (GRAMS)                            .73
   CO   MASS (GRAMS)                           2.09
   CO2 MASS (GRAMS)                         4853.35
   NOX MASS (GRAMS)                           12.91
   SO2 MASS (GRAMS)                            0.00

HC   GRAMS/KILOMETRE       .04
CO   GRAMS/KILOMETRE       .13
CO2 GRAMS/KILOMETRE   295
NOX GRAMS/KILOMETRE       .78
SO2 GRAMS/KILOMETRE      0.00

HC   GRAMS/KG OF FUEL     .48      HC   GRAMS/MIN     .06
CO   GRAMS/KG OF FUEL     1.4      CO   GRAMS/MIN      .2
CO2 GRAMS/KG OF FUEL   3166      CO2 GRAMS/MIN     381
NOX GRAMS/KG OF FUEL    8.42      NOX GRAMS/MIN    1.01
SO2 GRAMS/KG OF FUEL    0.00      SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECCNOMY =   12.60 LITRES PER HUNDRED KILOMETERS
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER   9

DATE  6/28/77              TIME    -0 HRS.          TEST NO.  3
MODEL  1975 NOVA CHEVY     FET                      ENGINE 5.7 LITRED
RUN DURATION   12.75 MIN.  DISTANCE DRIVEN  16.48 KILOMETRES
CVS BLOWER TEST VOL.  137.53 ACT. CU. METRES

                          SAMPLE                    BACKGROUND
SULFATE DATA              ------                    ----------

 FILTER NO.              47FH-2848
 SAMPLE VOL. CU. FT.        7.62                         1.00
 SAMPLE TEMP. DEG. F          82                           70
 SAMPLE AREA SQ. IN.    125975.00                        0.00
 DILUTION FACTOR               5                            1
 STAND. DEN. MICROG/ML     20.00                         1.00
 STAND. AREA SQ. IN.   204539.00                         1.00
 SO4,MICROG/FILTER       615.897                        0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.        1.00                         1.00
 SAMPLE TEMP. DEG. F          70                           70
 AREA,BUBBLER 1             0.00                         0.00
 DIL. FACT.,BUBBLER 1          1                            1
 AREA,BUBBLER 2             0.00                         0.00
 DIL. FACT.,BUBBLER 2          1                            1
 STAND. DEN. MICROG/ML      1.00                         1.00
 STAND. AREA,SQ. IN.        1.00                         1.00
 SO2, MILLIG/BUBBLER 1     0.000                        0.000
 SO2, MILLIG/BUBBLER 2     0.000                        0.000
 SO2, PPM                    0.0                          0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST          444.538
 NET H2SO4,MILLIGRAM/TEST            453.874
 NET SO2,GRAM/TEST                     0.000
 NET SULFATE,MILLIGRAM/KILOMETRE      26.975
 NET H2SO4,MILLIGRAM/KILOMETRE        27.542
 NET SO2,GRAM/KILOMETRE                0.000

SULFUR BALANCE
 FUEL WT., 1533 GRAMS     SULFUR IN FUEL, .0310 PCT.
                           FUEL       SO2       H2SO4       SO2 + H2SO4
                           ----      -----     -------     -----------
          SULFUR,GRAMS      .48      0.000      .1484          .1484
          PCT. RECOVERY              0.00      31.23          31.23
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                              TAPLF                          VEHICLE EMISSION RESULTS
                                                       1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  EM9          TEST NO. 1             DATE  7/ 1/77                          MFGR. CODE   -0                 YR.  1975
VEHICLE MODEL  NOVA CHEVY                     ENGINE   5.74 LITRE 8                  CURR WT.     0 KG               GVM      0 KG

BAROMETER 742.44 MM OF HG.
DRY BULB TEMP.    26.1 DEG. C                                        WET BULB TEMP  22.2 DEG. C
REL. HUMIDITY      71 PCT.                                            ABS. HUMIDITY  15.6 GRAMS/KG

EXHAUST EMISSIONS

     BLOWER DIF. PRESS., G2, 711.2 MM. H2O                           BLOWER INLET PRESS., G1 711.2 MM. H2O
     BAG RESULTS                                                     BLOWER INLET TEMP.    42 DEG. C
     BAG NO.                                        1             2             3
     BLOWER REVOLUTIONS                         40571         69710         40574
     HC    SAMPLE  METER READING/SCALE           69.1/2        22.7/2        30.1/2
     HC    SAMPLE  PPM                            69            23            30
     HC    BACKGRD METER READING/SCALE          14.1/2        13.5/2        13.7/2
     HC    BACKGRD PPM                            14            13            14
     CO    SAMPLE  METER READING/SCALE          88.1/*        33.3/*        67.3/*
     CO    SAMPLE  PPM                           212            31            65
     CO    BACKGRD METER READING/SCALE            .4/*          .7/*         1.7/*
     CO    BACKGRD PPM                             1             1             2
     CO2   SAMPLE  METER READING/SCALE          43.4/2        62.9/3        85.6/3
     CO2   SAMPLE  PERCENT                      1.92          1.12          1.59
     CO2   BACKGRD METER READING/SCALE           2.0/2         1.9/2         3.9/3
     CO2   BACKGRD PERCENT                       .07           .07           .06
     NOX   SAMPLE  METER READING/SCALE          59.7/2        13.8/2        32.3/2
     NOX   SAMPLE  PPM                          59.7          13.8          32.3
     NOX   BACKGRD METER READING/SCALE            .9/2          .9/2          .7/2
     NOX   BACKGRD PPM                            .9            .9            .7
     SO2   SAMPLE  METER READING/SCALE          -0.0/*        -0.0/*        -0.0/*
     SO2   SAMPLE  PPM                          -0.0          -0.0          -0.0
     SO2   BACKGRD METER READING/SCALE          -0.0/*        -0.0/*        -0.0/*
     SO2   BACKGRD PPM                          -0.0          -0.0          -0.0

     HC    CONCENTRATION PPM                      57            10            18
     CO    CONCENTRATION PPM                     194            29            60
     CO2   CONCENTRATION PCT                    1.86          1.06          1.53
     NOX   CONCENTRATION PPM                    58.9          13.0          31.7
     SO2   CONCENTRATION PPM                     0.0           0.0           0.0
     HC    MASS GRAMS                           2.51           .78           .79
     CO    MASS GRAMS                          17.62          4.36          5.35
     CO2   MASS GRAMS                        2601.64       2546.27       2148.57
     NOX   MASS GRAMS                          10.21          3.86          5.49
     SO2   MASS GRAMS                           0.00          0.00          0.00

     WEIGHTED MASS HC        .19 GRAMS/KILOMETRE
     WEIGHTED MASS CO       1.24 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    405.19 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .94 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =    5.8  KILOMETRE/LITRE
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          TABLE         EXHAUST EMISSIONS FROM THREE BAG  SAMPLE
                             VEHICLE NUMBER EM9

DATE  1/ 7/77             TIME      1 HRS.         TEST NO.  1
MODEL  1975 NOVA CHEVY    EM-9                     ENGINE 5.7 LITRED
RUN DURATION   31.31 MIN.  DISTANCE DRIVEN  17.84 KILOMETRES
CVS BLOWER TEST VOL.  336.19 ACT. CU. METRES

                             SAMPLE                  BACKGROUND
SULFATE DATA                 ------                  ----------

 FILTER NO.              47-FH-2849
 SAMPLE VOL. CU. FT.        19.34                        1.00
 SAMPLE TEMP. DEG. F           79                          70
 SAMPLE AREA SQ. IN.      2817.00                        0.00
 DILUTION FACTOR                1                           1
 STAND. DEN. MICROG/ML      20.00                        1.00
 STAND. AREA SQ. IN.    204539.00                        1.00
 SO4,MICROG/FILTER          2.754                       0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.         1.00                        1.00
 SAMPLE TEMP. DEG. F           70                          70
 AREA,BUBBLER 1              0.00                        0.00
 DIL. FACT.,BUBBLER 1           1                           1
 AREA,BUBBLER 2              0.00                        0.00
 DIL. FACT.,BUBBLER 2           1                           1
 STAND. DEN. MICROG/ML       1.00                        1.00
 STAND. AREA,SQ. IN.         1.00                        1.00
 SO2, MILLIG/BUBBLER 1      0.000                       0.000
 SO2, MILLIG/BUBBLER 2      0.000                       0.000
 SO2, PPM                     0.0                         0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST             1.920
 NET H2SO4,MILLIGRAM/TEST               1.960
 NET SO2,GRAM/TEST                      0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         .108
 NET H2SO4,MILLIGRAM/KILOMETRE           .110
 NET SO2,GRAM/KILOMETRE                 0.000

SULFUR BALANCE
 FUEL WT., 2318 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2       H2SO4        SO2 + H2SO4
                            ----     -----     -------      -----------
           SULFUR,GRAMS      .72     0.000      .0006            .0006
           PCT. RECOVERY              0.00        .09              .09
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     TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER   9

DATE  7/ 1/77               TIME    -0 HRS.         TEST NO.  2
MODEL  1975 NOVA CHEVY      SET-7                   ENGINE 5.7 LITREV 8
DRIVER   SR                 TEST WT.  1814 KG.      GVW     0 KG
WET BULB TEMP  19 C         DRY BULB TEMP  24 C     REL. HUM.  62.3 PCT
SPEC. HUM.  11.8 GRAM/KG    BARO.  742.7 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION          23.26 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS     31878
  BLOWER REVOLUTIONS    112226
  BLOWER CU. CM /REV.  2230

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE           21.1/2
   HC  SAMPLE  PPM                             21
   HC  BACKGRD METER READING/SCALE           12.7/2
   HC  BACKGRD PPM                             13
   CO  SAMPLE  METER READING/SCALE           21.7/*
   CO  SAMPLE  PPM                             20
   CO  BACKGRD METER READING/SCALE             .1/*
   CO  BACKGRD PPM                              0
   CO2 SAMPLE  METER READING/SCALE           97.3/3
   CO2 SAMPLE  PERCENT                       1.83
   CO2 BACKGRD METER READING/SCALE            3.8/3
   CO2 BACKGRD PERCENT                        .06
   NOX SAMPLE  METER READING/SCALE           46.7/2
   NOX SAMPLE  PPM                           46.7
   NOX BACKGRD METER READING/SCALE            1.2/2
   NOX BACKGRD PPM                            1.2
   HC  CONCENTRATION PPM                      10
   CO  CONCENTRATION PPM                      19
   CO2 CONCENTRATION PCT                     1.78
   NOX CONCENTRATION PPM                     45.7
   SO2 COCENTRATION PPM                      0.0
   HC  MASS (GRAMS)                          1.23
   CO  MASS (GRAMS)                          4.68
   CO2 MASS (GRAMS)                        6899.40
   NOX MASS (GRAMS)                         19.08
   SO2 MASS (GRAMS)                          0.00

HC  GRAMS/KILOMETRE       .06
CO  GRAMS/KILOMETRE       .21
CO2 GRAMS/KILOMETRE    314
NOX GRAMS/KILOMETRE       .87
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL     .56     HC  GRAMS/MIN     .05
CO  GRAMS/KG OF FUEL     2.1     CO  GRAMS/MIN      .2
CO2 GRAMS/KG OF FUEL    3164     CO2 GRAMS/MIN     297
NOX GRAMS/KG OF FUEL    8.75     NOX GRAMS/MIN     .82
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =   13.44 LITRES PER HUNDRED KILOMETERS
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                           VEHICLE NUMBER   9

DATE  7/ 1/77               TIME     -0 HRS.         TEST NO.  2
MODEL  1976 NOVA CHEVY      SET-7                    ENGINE 5.7 LITRED
RUN DURATION   23.26 MIN.  DISTANCE DRIVEN  21.98 KILOMETRES
CVS BLOWER TEST VOL.  250.31 ACT. CU. METRES

                            SAMPLE                   BACKGROUND
SULFATE DATA                ------                   ----------

 FILTER NO.                47FH-2850
 SAMPLE VOL. CU. FT.          14.89                        1.00
 SAMPLE TEMP. DEG. F             80                          70
 SAMPLE AREA SQ. IN.      278458.00                        0.00
 DILUTION FACTOR                  1                           1
 STAND. DEN. MICROG/ML        20.00                        1.00
 STAND. AREA SQ. IN.      204539.00                        1.00
 SO4,MICROG/FILTER          272.318                       0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.           1.00                        1.00
 SAMPLE TEMP. DEG. F             70                          70
 AREA,BUBBLER 1                0.00                        0.00
 DIL. FACT.,BUBBLER 1             1                           1
 AREA,BUBBLER 2                0.00                        0.00
 DIL. FACT.,BUBBLER 2             1                           1
 STAND. DEN. MICROG/ML         1.00                        1.00
 STAND. AREA,SQ. IN.           1.00                        1.00
 SO2, MILLIG/BUBBLER 1        0.000                       0.000
 SO2, MILLIG/BUBBLER 2        0.000                       0.000
 SO2, PPM                       0.0                         0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST            183.627
 NET H2SO4,MILLIGRAM/TEST              187.483
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         8.355
 NET H2SO4,MILLIGRAM/KILOMETRE           8.530
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2180 GRAMS       SULFUR IN FUEL, .0310 PCT.
                             FUEL      SO2      H2SO4       SO2 + H2SO4
                             ----     -----    -------     -----------
            SULFUR,GRAMS      .68     0.000     .0613            .0613
            PCT. RECOVERY              0.00      9.07             9.07
      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                           VEHICLE NUMBER   9

DATE  7/ 1/77              TIME     -0 HRS.         TEST NO.  3
MODEL  1975 NOVA CHEVY     FET                      ENGINE 5.7 LITREV 8
DRIVER   SR                TEST WT.  1814 KG.       GVW    0 KG
WET BULB TEMP  19 C        DRY BULB TEMP  26 C      REL. HUM.  56.5 PCT
SPEC. HUM.  11.8 GRAM/KG   BARO.  742.7 MM  HG.     MEASURED FUEL  0.00 KG

  RUN DURATION         12.77 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    24204
  BLOWER REVOLUTIONS    61644
  BLOWER CU. CM /REV.  2231

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE           18.4/2
   HC  SAMPLE  PPM                             18
   HC  BACKGRD METER READING/SCALE           12.1/2
   HC  BACKGRD PPM                             12
   CO  SAMPLE  METER READING/SCALE           14.9/*
   CO  SAMPLE  PPM                             15
   CO  BACKGRD METER READING/SCALE             .3/*
   CO  BACKGRD PPM                              0
   CO2 SAMPLE  METER READING/SCALE           52.1/2
   CO2 SAMPLE  PERCENT                       2.40
   CO2 BACKGRD METER READING/SCALE            1.7/2
   CO2 BACKGRD PERCENT                        .06
   NOX SAMPLE  METER READING/SCALE           67.4/2
   NOX SAMPLE  PPM                           67.4
   NOX BACKGRD METER READING/SCALE            1.4/2
   NOX BACKGRD PPM                            1.4
   HC  CONCENTRATION PPM                        8
   CO  CONCENTRATION PPM                       14
   CO2 CONCENTRATION PCT                     2.35
   NOX CONCENTRATION PPM                     66.3
   SO2 COCENTRATION PPM                      0.0
   HC  MASS (GRAMS)                           .57
   CO  MASS (GRAMS)                           .56
   CO2 MASS (GRAMS)                        5003.53
   NOX MASS (GRAMS)                          15.22
   SO2 MASS (GRAMS)                          0.00

HC  GRAMS/KILOMETRE       .03
CO  GRAMS/KILOMETRE       .03
CO2 GRAMS/KILOMETRE   300
NOX GRAMS/KILOMETRE       .91
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL     .36     HC  GRAMS/MIN     .04
CO  GRAMS/KG OF FUEL      .4     CO  GRAMS/MIN      .0
CO2 GRAMS/KG OF FUEL    3168     CO2 GRAMS/MIN     392
NOX GRAMS/KG OF FUEL    9.63     NOX GRAMS/MIN    1.19
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =   12.82 LITRES PER HUNDRED KILOMETERS
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TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                     VEHICLE NUMBER   9

DATE  7/ 1/77              TIME     -0 HRS.        TEST NO.  3
MODEL  1975 NOVA CHEVY     FET                     ENGINE 5.7 LITREO
RUN DURATION   12.77 MIN.  DISTANCE DRIVEN  16.69 KILOMETRES
CVS BLOWER TEST VOL.  137.50 ACT. CU. METRES

                              SAMPLE                     BACKGROUND
SULFATE DATA                  ------                     ----------

 FILTER NO.                 47FH-2851
 SAMPLE VOL. CU. FT.            7.37                          1.00
 SAMPLE TEMP. DEG. F              84                            70
 SAMPLE AREA SQ. IN.       117928.00                          0.00
 DILUTION FACTOR                   5                             1
 STAND. DEN. MICROG/ML         20.00                          1.00
 STAND. AREA SQ. IN.       204691.00                          1.00
 SO4,MICROG/FILTER           576.127                         0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.           1.00                           1.00
 SAMPLE TEMP. DEG. F             70                             70
 AREA,BUBBLER 1                0.00                           0.00
 DIL. FACT.,BUBBLER 1             1                              1
 AREA,BUBBLER 2                0.00                           0.00
 DIL. FACT.,BUBBLER 2             1                              1
 STAND. DEN. MICROG/ML         1.00                           1.00
 STAND. AREA,SQ. IN.           1.00                           1.00
 SO2, MILLIG/BUBBLER 1        0.000                          0.000
 SO2, MILLIG/BUBBLER 2        0.000                          0.000
 SO2, PPM                       0.0                            0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST               427.850
 NET H2SO4,MILLIGRAM/TEST                 436.835
 NET SO2,GRAM/TEST                          0.000
 NET SULFATE,MILLIGRAM/KILOMETRE           25.638
 NET H2SO4,MILLIGRAM/KILOMETRE             26.176
 NET SO2,GRAM/KILOMETRE                     0.000

SULFUR BALANCE
 FUEL WT., 1580 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2       H2SO4       SO2 + H2SO4
                            ----     -----     -------     -----------
          SULFUR,GRAMS       .49     0.000       .1428         .1428
          PCT. RECOVERY              0.00       29.17         29.17
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                 TABLE                        VEHICLE EMISSION RESULTS
                                           1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.    9       TEST NO. 1        DATE  7/20/77                       MFGR. CODE   -0            YR.  1975
VEHICLE MODEL  NOVA CHEVROLET         ENGINE   5.74 LITRE 8               CURB WT.      0 KG         GVM      0 KG

BAROMETER 740.92 MM OF HG.                                         WET BULB TEMP  18.3 DEG. C
DRY BULB TEMP.    22.2 DEG. C                                       ABS. HUMIDITY  11.8 GRAMS/KG
REL. HUMIDITY      69 PCT.

EXHAUST EMISSIONS
                                                                   BLOWER INLET PRESS., G1 711.2 MM. H2O
     BLOWER DIF. PRESS., G2, 711.2 MM. H2O                         BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                       1              2              3
     BLOWER REVOLUTIONS                          40648          69767          40603
     HC    SAMPLE  METER READING/SCALE           66.6/2         20.4/2         25.1/2
     HC    SAMPLE  PPM                           67             20             25
     HC    BACKGRD METER READING/SCALE           15.6/2         14.6/2         13.7/2
     HC    BACKGRD PPM                           16             15             14
     CO    SAMPLE  METER READING/SCALE           66.5/*         63.6/*         93.0/*
     CO    SAMPLE  PPM                           277            63             95
     CO    BACKGRD METER READING/SCALE           2.5/*          2.2/*          4.7/*
     CO    BACKGRD PPM                           8              7              5
     CO2   SAMPLE  METER READING/SCALE           43.6/2         65.6/3         83.7/3
     CO2   SAMPLE  PERCENT                       1.93           1.18           1.55
     CO2   BACKGRD METER READING/SCALE           1.6/2          1.6/2          3.9/3
     CO2   BACKGRD PERCENT                       .06            .06            .06
     NOX   SAMPLE  METER READING/SCALE           63.7/2         11.9/2         30.9/2
     NOX   SAMPLE  PPM                           63.7           11.9           30.9
     NOX   BACKGRD METER READING/SCALE           1.3/2          1.3/2          1.0/2
     NOX   BACKGRD PPM                           1.3            1.3            1.0
     SO2   SAMPLE  METER READING/SCALE           -0.0/*         -0.0/*         -0.0/*
     SO2   SAMPLE  PPM                           -0.0           -0.0           -0.0
     SO2   BACKGRD METER READING/SCALE           -0.0/*         -0.0/*         -0.0/*
     SO2   BACKGRD PPM                           -0.0           -0.0           -0.0

     HC    CONCENTRATION PPM                     53             7              13
     CO    CONCENTRATION PPM                     254            55             86
     CO2   CONCENTRATION PCT                     1.88           1.12           1.49
     NOX   CONCENTRATION PPM                     62.6           10.7           30.0
     SO2   CONCENTRATION PPM                     0.0            0.0            0.0
     HC    MASS GRAMS                            2.34           .53            .57
     CO    MASS GRAMS                            22.53          8.31           7.58
     CO2   MASS GRAMS                            2630.62        2695.11        2087.58
     NOX   MASS GRAMS                            9.46           2.78           4.53
     SO2   MASS GRAMS                            0.00           0.00           0.00

     WEIGHTED MASS HC       .15 GRAMS/KILOMETRE
     WEIGHTED MASS CO      1.85 GRAMS/KILOMETRE
     WEIGHTED MASS CO2   415.68 GRAMS/KILOMETRE
     WEIGHTED MASS NOX      .78 GRAMS/KILOMETRE
     WEIGHTED MASS SO2     0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.6  KILOMETRE/LITRE
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         TABLE        EXHAUST EMISSIONS FROM THREE BAG  SAMPLE
                            VEHICLE NUMBER   9

DATE 20/ 7/77                 TIME *0000 HRS.         TEST NO.  1
MODEL  1975 NOVA CHEVROLET                            ENGINE 5.7 LITREO
RUN DURATION   31.32 MIN.  DISTANCE DRIVEN  17.84 KILOMETRES
CVS BLOWER TEST VOL.  336.81 ACT. CU. METRES

                              SAMPLE                  BACKGROUND
SULFATE DATA                  ------                  ----------

 FILTER NO.                47FH-2852
 SAMPLE VOL. CU. FT.          18.03                        1.00
 SAMPLE TEMP. DEG. F          75                           70
 SAMPLE AREA SQ. IN.       94798.00                        0.00
 DILUTION FACTOR               1                            1
 STAND. DEN. MICROG/ML        5.00                         1.00
 STAND. AREA SQ. IN.      185265.00                        1.00
 SO4,MICROG/FILTER           25.584                       0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                         1.00
 SAMPLE TEMP. DEG. F          70                           70
 AREA,BUBBLER 1               0.00                         0.00
 DIL. FACT.,BUBBLER 1          1                            1
 AREA,BUBBLER 2               0.00                         0.00
 DIL. FACT.,BUBBLER 2          1                            1
 STAND. DEN. MICROG/ML        1.00                         1.00
 STAND. AREA,SQ. IN.          1.00                         1.00
 SO2, MILLIG/BUBBLER 1        0.000                        0.000
 SO2, MILLIG/BUBBLER 2        0.000                        0.000
 SO2, PPM                      0.0                          0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST             19.348
 NET H2SO4,MILLIGRAM/TEST               19.754
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         1.084
 NET H2SO4,MILLIGRAM/KILOMETRE           1.107
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2360 GRAMS     SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2      H2SO4       SO2 + H2SO4
                            ----     -----    -------     -----------
          SULFUR,GRAMS       .73     0.000     .0065           .0065
          PCT. RECOVERY              0.00       .88             .88
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER    9

DATE  7/20/77              TIME     -0 HRS.         TEST NO.  2
MODEL  1975 NOVA CHEVROLET SET-7                    ENGINE 5.7 LITREV 8
DRIVER   SR                TEST WT.  1814 KG.       GVW    0 KG
WET BULB TEMP  17 C        DRY BULB TEMP  23 C      REL. HUM.  54.4 PCT
SPEC. HUM.   9.9 GRAM/KG   BARO.  741.7 MM  HG.     MEASURED FUEL  0.00 KG

  RUN DURATION          23.27 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     42  DEG. C
  DYNO REVOLUTIONS    32354
  BLOWER REVOLUTIONS   112201
  BLOWER CU. CM /REV.  2229

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE           19.5/2
   HC  SAMPLE  PPM                             19
   HC  BACKGRD METER READING/SCALE           14.2/2
   HC  BACKGRD PPM                             14
   CO  SAMPLE  METER READING/SCALE           57.8/*
   CO  SAMPLE  PPM                            57
   CO  BACKGRD METER READING/SCALE            1.5/*
   CO  BACKGRD PPM                            2
   CO2 SAMPLE  METER READING/SCALE           43.4/2
   CO2 SAMPLE  PERCENT                       1.92
   CO2 BACKGRD METER READING/SCALE            2.0/2
   CO2 BACKGRD PERCENT                        .07
   NOX SAMPLE  METER READING/SCALE           48.3/2
   NOX SAMPLE  PPM                           48.3
   NOX BACKGRD METER READING/SCALE            2.0/2
   NOX BACKGRD PPM                            2.0
   HC  CONCENTRATION PPM                      7
   CO  CONCENTRATION PPM                     52
   CO2 CONCENTRATION PCT                     1.86
   NOX CONCENTRATION PPM                     46.6
   SO2 COCENTRATION PPM                      0.0
   HC  MASS (GRAMS)                           .89
   CO  MASS (GRAMS)                         12.78
   CO2 MASS (GRAMS)                       7186.27
   NOX MASS (GRAMS)                         18.29
   SO2 MASS (GRAMS)                          0.00

HC  GRAMS/KILOMETRE       .04
CO  GRAMS/KILOMETRE       .57
CO2 GRAMS/KILOMETRE   322
NOX GRAMS/KILOMETRE       .82
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL     .39     HC  GRAMS/MIN     .04
CO  GRAMS/KG OF FUEL     5.6     CO  GRAMS/MIN      .5
CO2 GRAMS/KG OF FUEL    3159     CO2 GRAMS/MIN    309
NOX GRAMS/KG OF FUEL    8.04     NOX GRAMS/MIN     .79
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   13.81 LITRES PER HUNDRED KILOMETERS
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     TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER   9

DATE  7/20/77                TIME    -0 HRS.        TEST NO.  2
MODEL  1975 NOVA CHEVROLET SET-7                    ENGINE 5.7 LITREO
RUN DURATION   23.27 MIN.  DISTANCE DRIVEN  22.31 KILOMETRES
CVS BLOWER TEST VOL.  250.05 ACT. CU. METRES

                             SAMPLE                 BACKGROUND
SULFATE DATA                 ------                 ----------

 FILTER NO.               47FH-2853
 SAMPLE VOL. CU. FT.        14.16                        1.00
 SAMPLE TEMP. DEG. F        77                           70
 SAMPLE AREA SQ. IN.     178791.00                       0.00
 DILUTION FACTOR             1                            1
 STAND. DEN. MICROG/ML      20.00                        1.00
 STAND. AREA SQ. IN.     214134.00                       1.00
 SO4,MICROG/FILTER         166.990                      0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.         1.00                        1.00
 SAMPLE TEMP. DEG. F          70                          70
 AREA,BUBBLER 1              0.00                        0.00
 DIL. FACT.,BUBBLER 1          1                           1
 AREA,BUBBLER 2              0.00                        0.00
 DIL. FACT.,BUBBLER 2          1                           1
 STAND. DEN. MICROG/ML       1.00                        1.00
 STAND. AREA,SQ. IN.         1.00                        1.00
 SO2, MILLIG/BUBBLER 1      0.000                       0.000
 SO2, MILLIG/BUBBLER 2      0.000                       0.000
 SO2, PPM                     0.0                         0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST            118.731
 NET H2SO4,MILLIGRAM/TEST              121.224
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         5.322
 NET H2SO4,MILLIGRAM/KILOMETRE           5.434
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2275 GRAMS     SULFUR IN FUEL, .0310 PCT.
                             FUEL      SO2       H2SO4       SO2 + H2SO4
                             ----     -----     -------     -----------
           SULFUR,GRAMS       .71     0.000      .0396          .0396
           PCT. RECOVERY              0.00       5.62           5.62
```

```
      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                           VEHICLE NUMBER   9

DATE  7/20/77             TIME    -0 HRS.         TEST NO.  3
MODEL  1975 NOVA CHEVROLET FET                    ENGINE 5.7 LITREV 8
DRIVER   SR               TEST WT.  1814 KG.      GVW    0 KG
WET BULB TEMP  18 C       DRY BULB TEMP  26 C     REL. HUM.  49.7 PCT
SPEC. HUM.  10.4 GRAM/KG  BARO.  741.7 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION         12.78 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     42  DEG. C
  DYNO REVOLUTIONS    24238
  BLOWER REVOLUTIONS    61603
  BLOWER CU. CM /REV.  2229

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE          16.5/2
   HC  SAMPLE  PPM                            16
   HC  BACKGRD METER READING/SCALE          13.8/2
   HC  BACKGRD PPM                            14
   CO  SAMPLE  METER READING/SCALE          15.1/*
   CO  SAMPLE  PPM                            14
   CO  BACKGRD METER READING/SCALE           1.6/*
   CO  BACKGRD PPM                             2
   CO2 SAMPLE  METER READING/SCALE          53.1/2
   CO2 SAMPLE  PERCENT                      2.46
   CO2 BACKGRD METER READING/SCALE           2.1/2
   CO2 BACKGRD PERCENT                       .08
   NOX SAMPLE  METER READING/SCALE          68.7/2
   NOX SAMPLE  PPM                          68.7
   NOX BACKGRD METER READING/SCALE           1.7/2
   NOX BACKGRD PPM                           1.7
   HC  CONCENTRATION PPM                       5
   CO  CONCENTRATION PPM                      12
   CO2 CONCENTRATION PCT                    2.40
   NOX CONCENTRATION PPM                    67.3
   SO2 COCENTRATION PPM                     0.0
   HC  MASS (GRAMS)                          .35
   CO  MASS (GRAMS)                         1.60
   CO2 MASS (GRAMS)                      5095.50
   NOX MASS (GRAMS)                        14.72
   SO2 MASS (GRAMS)                         0.00

HC  GRAMS/KILOMETRE      .02
CO  GRAMS/KILOMETRE      .10
CO2 GRAMS/KILOMETRE   305
NOX GRAMS/KILOMETRE      .88
SO2 GRAMS/KILOMETRE     0.00

HC  GRAMS/KG OF FUEL    .22     HC  GRAMS/MIN    .03
CO  GRAMS/KG OF FUEL    1.0     CO  GRAMS/MIN     .1
CO2 GRAMS/KG OF FUEL   3167     CO2 GRAMS/MIN    399
NOX GRAMS/KG OF FUEL   9.15     NOX GRAMS/MIN   1.15
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   13.04 LITRES PER HUNDRED KILOMETERS
```

```
      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                               VEHICLE NUMBER    9

DATE  7/20/77                   TIME    -0 HRS.         TEST NO.  3
MODEL  1975 NOVA CHEVROLET FET                          ENGINE 5.7 LITRED
RUN DURATION   12.78 MIN.  DISTANCE DRIVEN  16.71 KILOMETRES
CVS BLOWER TEST VOL.  137.29 ACT. CU. METRES

                               SAMPLE                   BACKGROUND
SULFATE DATA                   ------                   ----------

 FILTER NO.                 47FH-2854
 SAMPLE VOL. CU. FT.            7.34                        1.00
 SAMPLE TEMP. DEG. F              83                          70
 SAMPLE AREA SQ. IN.        87765.00                        0.00
 DILUTION FACTOR                   5                           1
 STAND. DEN. MICROG/ML         20.00                        1.00
 STAND. AREA SQ. IN.       214134.00                        1.00
 SO4,MICROG/FILTER           409.860                       0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.            1.00                        1.00
 SAMPLE TEMP. DEG. F              70                          70
 AREA,BUBBLER 1                 0.00                        0.00
 DIL. FACT.,BUBBLER 1              1                           1
 AREA,BUBBLER 2                 0.00                        0.00
 DIL. FACT.,BUBBLER 2              1                           1
 STAND. DEN. MICROG/ML          1.00                        1.00
 STAND. AREA,SQ. IN.            1.00                        1.00
 SO2, MILLIG/BUBBLER 1         0.000                       0.000
 SO2, MILLIG/BUBBLER 2         0.000                       0.000
 SO2, PPM                        0.0                         0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST            305.417
 NET H2SO4,MILLIGRAM/TEST              311.830
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE        18.276
 NET H2SO4,MILLIGRAM/KILOMETRE          18.659
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 1609 GRAMS      SULFUR IN FUEL, .0310 PCT.
                               FUEL     SO2        H2SO4       SO2 + H2SO4
                               ----    -----      -------      -----------
          SULFUR,GRAMS          .50    0.000       .1020             .1020
          PCT. RECOVERY                 0.00       20.44             20.44
```

```
        TABLE                       VEHICLE EMISSION RESULTS
                               1975  LIGHT DUTY EMISSIONS TEST
                                                               MFGR. CODE    -0                 YR.  1975
UNIT NO.     9        TEST NO. 1         DATE  7/22/77                                          GVM     0 KG
VEHICLE MODEL  NOVA CHEVROLET            ENGINE   5.74 LITRE 8             CURR WT.      0 KG

                                                               WET BULB TEMP  17.8 DEG. C
BAROMETER 744.47 MM OF HG.                                      ABS. HUMIDITY  10.8 GRAMS/KG
DRY BULB TEMP.    22.8 DEG. C
REL. HUMIDITY      61 PCT.

EXHAUST EMISSIONS                                              BLOWER INLET PRESS., G1 711.2 MM. H2O
                                                               BLOWER INLET TEMP.    43 DEG. C
     BLOWER DIF. PRESS., G2, 711.2 MM. H2O
     BAG RESULTS                                    1              2              3
     BAG NO.                                    40692          69757          40699
     BLOWER REVOLUTIONS                          72.8/2         21.9/2         29.0/2
     HC    SAMPLE   METER READING/SCALE          73             22             29
     HC    SAMPLE   PPM                          14.4/2         14.8/2         14.3/2
     HC    BACKGRD METER READING/SCALE           14             15             14
     HC    BACKGRD PPM                           60.1/*         46.9/*         88.4/*
     CO    SAMPLE   METER READING/SCALE         241            103             91
     CO    SAMPLE   PPM                           1.9/*          1.7/*          1.5/*
     CO    BACKGRD METER READING/SCALE            6              5              3
     CO    BACKGRD PPM                           44.9/2         65.7/3         88.3/3
     CO2   SAMPLE   METER READING/SCALE           2.00           1.18           1.64
     CO2   SAMPLE   PERCENT                       1.3/2          1.4/2          3.9/3
     CO2   BACKGRD METER READING/SCALE             .05            .05            .06
     CO2   BACKGRD PERCENT                       26.3/3         13.6/2         38.6/2
     NOX   SAMPLE   METER READING/SCALE          78.9           13.6           38.6
     NOX   SAMPLE   PPM                            .1/3           .1/3           .8/2
     NOX   BACKGRD METER READING/SCALE             .3             .3             .8
     NOX   BACKGRD PPM                           -0.0/*         -0.0/*         -0.0/*
     SO2   SAMPLE   METER READING/SCALE          -0.0           -0.0           -0.0
     SO2   SAMPLE   PPM                          -0.0/*         -0.0/*         -0.0/*
     SO2   BACKGRD METER READING/SCALE           -0.0           -0.0           -0.0
     SO2   BACKGRD PPM
                                                 61              8             16
     HC    CONCENTRATION PPM                    222             94             84
     CO    CONCENTRATION PPM                      1.96           1.13           1.59
     CO2   CONCENTRATION PCT                     78.6           13.3           37.9
     NOX   CONCENTRATION PPM                      0.0            0.0            0.0
     SO2   CONCENTRATION PPM                      2.68            .64            .73
     HC    MASS GRAMS                            19.78          14.35           7.51
     CO    MASS GRAMS                          2759.97        2729.96        2239.55
     CO2   MASS GRAMS                            11.56           3.36           5.57
     NOX   MASS GRAMS                             0.00           0.00           0.00
     SO2   MASS GRAMS

     WEIGHTED MASS HC        .18 GRAMS/KILOMETRE
     WEIGHTED MASS CO       2.25 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    430.35 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .95 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.4  KILOMETRE/LITRE
```

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         TABLE        EXHAUST EMISSIONS FROM THREE BAG  SAMPLE
                             VEHICLE NUMBER   9

DATE 22/ 2/77                TIME *0000 HRS.         TEST NO.  1
MODEL  1975 NOVA CHEVROLET                           ENGINE 5.7 LITREO
RUN DURATION   31.32 MIN.  DISTANCE DRIVEN  17.84 KILOMETRES
CVS BLOWER TEST VOL.  337.16 ACT. CU. METRES

                               SAMPLE                BACKGROUND
SULFATE DATA                   ------                ----------

 FILTER NO.                   47FH-2855
 SAMPLE VOL. CU. FT.             18.76                    1.00
 SAMPLE TEMP. DEG. F             74                       70
 SAMPLE AREA SQ. IN.          10550.00                    0.00
 DILUTION FACTOR                  1                       1
 STAND. DEN. MICROG/ML           20.00                    1.00
 STAND. AREA SQ. IN.         219195.00                    1.00
 SO4,MICROG/FILTER                9.670                   0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.              1.00                    1.00
 SAMPLE TEMP. DEG. F             70                       70
 AREA,BUBBLER 1                   0.00                    0.00
 DIL. FACT.,BUBBLER 1             1                       1
 AREA,BUBBLER 2                   0.00                    0.00
 DIL. FACT.,BUBBLER 2             1                       1
 STAND. DEN. MICROG/ML            1.00                    1.00
 STAND. AREA,SQ. IN.              1.00                    1.00
 SO2, MILLIG/BUBBLER 1            0.000                   0.000
 SO2, MILLIG/BUBBLER 2            0.000                   0.000
 SO2, PPM                         0.0                     0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST                 7.047
 NET H2SO4,MILLIGRAM/TEST                   7.195
 NET SO2,GRAM/TEST                          0.000
 NET SULFATE,MILLIGRAM/KILOMETRE             .395
 NET H2SO4,MILLIGRAM/KILOMETRE               .403
 NET SO2,GRAM/KILOMETRE                     0.000

SULFUR BALANCE
 FUEL WT., 2462 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL       SO2         H2SO4        SO2 + H2SO4
                            ----      -----       -------      -----------
             SULFUR,GRAMS    .76      0.000        .0024            .0024
             PCT. RECOVERY             0.00         .31              .31
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER    9

DATE  7/22/77                 TIME    -0 HRS.         TEST NO.  2
MODEL  1975 NOVA CHEVROLET SET-7                      ENGINE 5.7 LITRED
RUN DURATION   23.27 MIN.  DISTANCE DRIVEN  22.46 KILOMETRES
CVS BLOWER TEST VOL.  250.54 ACT. CU. METRES

                              SAMPLE                  BACKGROUND
SULFATE DATA                  ------                  ----------

 FILTER NO.                 47FH-2856
 SAMPLE VOL. CU. FT.           14.23                      1.00
 SAMPLE TEMP. DEG. F              77                        70
 SAMPLE AREA SQ. IN.       234549.00                      0.00
 DILUTION FACTOR                   1                         1
 STAND. DEN. MICROG/ML         20.00                      1.00
 STAND. AREA SQ. IN.       211684.00                      1.00
 SO4,MICROG/FILTER           221.603                     0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.            1.00                      1.00
 SAMPLE TEMP. DEG. F              70                        70
 AREA,BUBBLER 1                 0.00                      0.00
 DIL. FACT.,BUBBLER 1              1                         1
 AREA,BUBBLER 2                 0.00                      0.00
 DIL. FACT.,BUBBLER 2              1                         1
 STAND. DEN. MICROG/ML          1.00                      1.00
 STAND. AREA,SQ. IN.            1.00                      1.00
 SO2, MILLIG/BUBBLER 1         0.000                     0.000
 SO2, MILLIG/BUBBLER 2         0.000                     0.000
 SO2, PPM                        0.0                       0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST           157.555
 NET H2SO4,MILLIGRAM/TEST             160.864
 NET SO2,GRAM/TEST                      0.000
 NET SULFATE,MILLIGRAM/KILOMETRE        7.014
 NET H2SO4,MILLIGRAM/KILOMETRE          7.161
 NET SO2,GRAM/KILOMETRE                 0.000

SULFUR BALANCE
 FUEL WT., 2298 GRAMS     SULFUR IN FUEL, .0310 PCT.
                           FUEL      SO2       H2SO4      SO2 + H2SO4
                           ----     -----     -------     -----------
          SULFUR,GRAMS      .71     0.000       .0526           .0526
          PCT. RECOVERY              0.00        7.38            7.38
```

```
     TABLE          EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER   9

DATE  7/22/77                TIME    -0 HRS.        TEST NO.  2
MODEL  1975 NOVA CHEVROLET SET-7                    ENGINE 5.7 LITRE  8
DRIVER   SR                  TEST WT.  1814 KG.     GVW    0 KG
WET BULB TEMP  19 C          DRY BULB TEMP  24 C    REL. HUM.  62.8 PCT
SPEC. HUM.  12.3 GRAM/KG     BARO.  744.7 MM  HG.   MEASURED FUEL  0.00 KG

  RUN DURATION          23.27 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H20
  BLOWER DIF.  PRESS. 711.2  MM  H20
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    32580
  BLOWER REVOLUTIONS   112233
  BLOWER CU. CM /REV.  2232

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE             19.4/2
   HC  SAMPLE  PPM                              19
   HC  BACKGRD METER READING/SCALE             14.1/2
   HC  BACKGRD PPM                              14
   CO  SAMPLE  METER READING/SCALE             55.8/*
   CO  SAMPLE  PPM                              54
   CO  BACKGRD METER READING/SCALE              1.2/*
   CO  BACKGRD PPM                               1
   CO2 SAMPLE  METER READING/SCALE             43.6/2
   CO2 SAMPLE  PERCENT                         1.93
   CO2 BACKGRD METER READING/SCALE              1.9/2
   CO2 BACKGRD PERCENT                          .07
   NOX SAMPLE  METER READING/SCALE             53.3/2
   NOX SAMPLE  PPM                             53.3
   NOX BACKGRD METER READING/SCALE              1.2/2
   NOX BACKGRD PPM                              1.2
   HC  CONCENTRATION PPM                         7
   CO  CONCENTRATION PPM                        50
   CO2 CONCENTRATION PCT                       1.87
   NOX CONCENTRATION PPM                       52.3
   SO2 COCENTRATION PPM                        0.0
   HC  MASS (GRAMS)                             .89
   CO  MASS (GRAMS)                           12.30
   CO2 MASS (GRAMS)                         7260.91
   NOX MASS (GRAMS)                           22.24
   SO2 MASS (GRAMS)                            0.00

HC  GRAMS/KILOMETRE        .04
CO  GRAMS/KILOMETRE        .55
CO2 GRAMS/KILOMETRE    323
NOX GRAMS/KILOMETRE        .39
SO2 GRAMS/KILOMETRE       0.00

HC  GRAMS/KG OF FUEL     .39     HC  GRAMS/MIN    .04
CO  GRAMS/KG OF FUEL     5.4     CO  GRAMS/MIN     .5
CO2 GRAMS/KG OF FUEL    3160     CO2 GRAMS/MIN    312
NOX GRAMS/KG OF FUEL    9.68     NOX GRAMS/MIN    .96
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   13.86 LITRES PER HUNDRED KILOMETERS
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER   9

DATE  7/22/77              TIME    -0 HRS.         TEST NO.  3
MODEL  1977 NOVA CHEVROLET FET                     ENGINE 5.7 LITRE  8
DRIVER   SR                TEST WT.  1814 KG.      GVW    0 KG
WET BULB TEMP  18 C        DRY BULB TEMP  22 C     REL. HUM.  68.9 PCT
SPEC. HUM.  11.9 GRAM/KG   BARO.  744.7 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION          12.76 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H20
  BLOWER DIF.  PRESS. 711.2  MM  H20
  BLOWER INLET TEMP.      43  DEG. C
  DYNO REVOLUTIONS     24611
  BLOWER REVOLUTIONS     61554
  BLOWER CU. CM /REV.  2232

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE              17.4/2
   HC  SAMPLE  PPM                                17
   HC  BACKGRD METER READING/SCALE              13.9/2
   HC  BACKGRD PPM                                14
   CO  SAMPLE  METER READING/SCALE              37.2/*
   CO  SAMPLE  PPM                                34
   CO  BACKGRD METER READING/SCALE               1.7/*
   CO  BACKGRD PPM                                 2
   CO2 SAMPLE  METER READING/SCALE              54.3/2
   CO2 SAMPLE  PERCENT                          2.53
   CO2 BACKGRD METER READING/SCALE               2.1/2
   CO2 BACKGRD PERCENT                           .08
   NOX SAMPLE  METER READING/SCALE              78.9/2
   NOX SAMPLE  PPM                              78.9
   NOX BACKGRD METER READING/SCALE               1.5/2
   NOX BACKGRD PPM                               1.5
   HC  CONCENTRATION PPM                           6
   CO  CONCENTRATION PPM                          30
   CO2 CONCENTRATION PCT                        2.47
   NOX CONCENTRATION PPM                        77.7
   SO2 COCENTRATION PPM                         0.0
   HC  MASS (GRAMS)                              .41
   CO  MASS (GRAMS)                             4.09
   CO2 MASS (GRAMS)                          5254.80
   NOX MASS (GRAMS)                            17.82
   SO2 MASS (GRAMS)                             0.00

HC  GRAMS/KILOMETRE       .02
CO  GRAMS/KILOMETRE       .24
CO2 GRAMS/KILOMETRE   310
NOX GRAMS/KILOMETRE      1.05
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL     .25     HC  GRAMS/MIN     .03
CO  GRAMS/KG OF FUEL     2.5     CO  GRAMS/MIN      .3
CO2 GRAMS/KG OF FUEL    3165     CO2 GRAMS/MIN     412
NOX GRAMS/KG OF FUEL   10.73     NOX GRAMS/MIN    1.40
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =    13.26 LITRES PER HUNDRED KILOMETERS
```

```
        TABLE       EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER   9

DATE  7/22/77                TIME    -0 HRS.         TEST NO.  3
MODEL  1977 NOVA CHEVROLET FET                       ENGINE 5.7 LITRED
RUN DURATION   12.76 MIN.  DISTANCE DRIVEN  16.97 KILOMETRES
CVS BLOWER TEST VOL.  137.41 ACT. CU. METRES

                                SAMPLE                   BACKGROUND
SULFATE DATA                    ------                   ----------

 FILTER NO.                   47FH-2857
 SAMPLE VOL. CU. FT.               7.79                      1.00
 SAMPLE TEMP. DEG. F                 82                        70
 SAMPLE AREA SQ. IN.           89931.00                      0.00
 DILUTION FACTOR                      5                         1
 STAND. DEN. MICROG/ML            20.00                      1.00
 STAND. AREA SQ. IN.          211684.00                      1.00
 SO4,MICROG/FILTER              424.836                     0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.               1.00                      1.00
 SAMPLE TEMP. DEG. F                  1                         1
 AREA,BUBBLER 1                    0.00                      0.00
 DIL. FACT.,BUBBLER 1                 1                         1
 AREA,BUBBLER 2                    0.00                      0.00
 DIL. FACT.,BUBBLER 2                 1                         1
 STAND. DEN. MICROG/ML             1.00                      1.00
 STAND. AREA,SQ. IN.               1.00                      1.00
 SO2, MILLIG/BUBBLER 1            0.000                     0.000
 SO2, MILLIG/BUBBLER 2            0.000                     0.000
 SO2, PPM                           0.0                       0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST               299.981
 NET H2SO4,MILLIGRAM/TEST                 306.281
 NET SO2,GRAM/TEST                          0.000
 NET SULFATE,MILLIGRAM/KILOMETRE           17.678
 NET H2SO4,MILLIGRAM/KILOMETRE             18.050
 NET SO2,GRAM/KILOMETRE                     0.000

SULFUR BALANCE
 FUEL WT., 1660 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2       H2SO4        SO2 + H2SO4
                            ----     -----     -------      -----------
               SULFUR,GRAMS  .51     0.000      .1002            .1002
               PCT. RECOVERY          0.00      19.46            19.46
```

APPENDIX D

COMPUTER PRINTOUTS
FOR
AIR MODULATION SYSTEM OPTIMIZATION AND DURABILITY TESTS ON THE 1975 CHEVROLET NOVA

(Tests in Chronological Order)

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                        TABLE                           VEHICLE EMISSION RESULTS
                                                   1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.             TEST NO. *          DATE  9/30/77                    MFGR. CODE   -0                 YR.  1975
VEHICLE MODEL  CHEVY NOVA                ENGINE   5.74 LITRE 8            CURB WT.     0 KG               GVM     0 KG

BAROMETER 736.35 MM OF HG.                                          WET BULB TEMP  20.0 DEG. C
DRY BULB TEMP.    25.6 DEG. C                                        ABS. HUMIDITY  12.7 GRAMS/KG
REL. HUMIDITY      60 PCT. .

EXHAUST EMISSIONS
                                                                    BLOWER INLET PRESS., G1 680.7 MM. H20
     BLOWER DIF. PRESS., G2, 680.7 MM. H20                          BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                         1             2             3
     BLOWER REVOLUTIONS                            40707         69920         40701
     HC    SAMPLE  METER READING/SCALE              92.7/2        17.3/2        21.6/2
     HC    SAMPLE  PPM                              93            17            22
     HC    BACKGRD METER READING/SCALE              13.7/2        12.8/2        10.9/2
     HC    BACKGRD PPM                              14            13            11
     CO    SAMPLE  METER READING/SCALE              27.0/3        61.2/*        55.4/*
     CO    SAMPLE  PPM                             631            61            54
     CO    BACKGRD METER READING/SCALE                .4/3         4.4/*         1.6/*
     CO    BACKGRD PPM                               9             4             2
     CO2   SAMPLE  METER READING/SCALE              98.3/3        62.2/3        84.4/3
     CO2   SAMPLE  PERCENT                           1.85          1.11          1.56
     CO2   BACKGRD METER READING/SCALE               4.3/3         4.9/3         4.6/3
     CO2   BACKGRD PERCENT                            .07           .08           .07
     NOX   SAMPLE  METER READING/SCALE              66.0/2        11.6/2        24.1/2
     NOX   SAMPLE  PPM                              66.0          11.6          24.1
     NOX   BACKGRD METER READING/SCALE               1.5/2         1.3/2          .9/2
     NOX   BACKGRD PPM                               1.5           1.3            .9
     SO2   SAMPLE  METER READING/SCALE              -0.0/*        -0.0/*        -0.0/*
     SO2   SAMPLE  PPM                              -0.0          -0.0          -0.0
     SO2   BACKGRD METER READING/SCALE              -0.0/*        -0.0/*        -0.0/*
     SO2   BACKGRD PPM                              -0.0          -0.0          -0.0

     HC    CONCENTRATION PPM                        81             6            12
     CO    CONCENTRATION PPM                       589            54            50
     CO2   CONCENTRATION PCT                         1.80          1.04          1.50
     NOX   CONCENTRATION PPM                        64.7          10.4          23.3
     SO2   CONCENTRATION PPM                         0.0           0.0           0.0
     HC    MASS GRAMS                                3.55           .42           .52
     CO    MASS GRAMS                               52.16          8.24          4.39
     CO2   MASS GRAMS                             2511.08       2491.59       2094.91
     NOX   MASS GRAMS                               10.07          2.78          3.63
     SO2   MASS GRAMS                                0.00          0.00          0.00

     WEIGHTED MASS HC        .19 GRAMS/KILOMETRE
     WEIGHTED MASS CO       2.75 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    394.90 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .76 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.4  KILOMETRE/LITRE
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                    TABLE                     VEHICLE EMISSION RESULTS
                                          1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.    9         TEST NO. 1          DATE 11/ 3/77                  MFGR. CODE    -0                YR.  1975
VEHICLE MODEL  NOVA CHEVROLET             ENGINE   5.74 LITRE 8          CURB WT.      0 KG              GVM      0 KG

BAROMETER 740.41 MM OF HG.                                               WET BULB TEMP  13.3 DEG. C
DRY BULB TEMP.   23.3 DEG. C                                              ABS. HUMIDITY   5.5 GRAMS/KG
REL. HUMIDITY     30 PCT.

EXHAUST EMISSIONS
                                                                         BLOWER INLET PRESS., G1 673.1 MM. H2O
     BLOWER DIF. PRESS., G2, 673.1 MM. H2O                               BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                        1              2              3
     BLOWER REVOLUTIONS                          40705          69816          40736
     HC   SAMPLE  METER READING/SCALE             8.5/3         14.5/2         22.7/2
     HC   SAMPLE  PPM                              85             14             23
     HC   BACKGRD METER READING/SCALE              .8/3          7.1/2          6.9/2
     HC   BACKGRD PPM                               8              7              7
     CO   SAMPLE  METER READING/SCALE            92.9/*         25.0/*         49.2/*
     CO   SAMPLE  PPM                             471             23             47
     CO   BACKGRD METER READING/SCALE             1.5/*          2.2/*          1.1/*
     CO   BACKGRD PPM                               5              2              1
     CO2  SAMPLE  METER READING/SCALE            95.1/3         60.5/3         87.2/3
     CO2  SAMPLE  PERCENT                        1.79           1.07           1.62
     CO2  BACKGRD METER READING/SCALE             3.9/3          3.7/3          3.5/3
     CO2  BACKGRD PERCENT                         .06            .06            .05
     NOX  SAMPLE  METER READING/SCALE            92.4/2         16.2/2         28.0/2
     NOX  SAMPLE  PPM                            92.4           16.2           28.0
     NOX  BACKGRD METER READING/SCALE             1.1/2           .7/2           .8/2
     NOX  BACKGRD PPM                             1.1             .7             .8
     SO2  SAMPLE  METER READING/SCALE            -0.0/*         -0.0/*         -0.0/*
     SO2  SAMPLE  PPM                            -0.0           -0.0           -0.0
     SO2  BACKGRD METER READING/SCALE            -0.0/*         -0.0/*         -0.0/*
     SO2  BACKGRD PPM                            -0.0           -0.0           -0.0

     HC   CONCENTRATION PPM                        78              8             17
     CO   CONCENTRATION PPM                       446             20             44
     CO2  CONCENTRATION PCT                      1.73           1.02           1.57
     NOX  CONCENTRATION PPM                      91.5           15.6           27.3
     SO2  CONCENTRATION PPM                       0.0            0.0            0.0
     HC   MASS GRAMS                             3.45            .60            .74
     CO   MASS GRAMS                            39.77           3.06           3.91
     CO2  MASS GRAMS                          2441.24        2464.82        2215.83
     NOX  MASS GRAMS                            11.44           3.34           3.42
     SO2  MASS GRAMS                             0.00           0.00           0.00

     WEIGHTED MASS HC        .21 GRAMS/KILOMETRE
     WEIGHTED MASS CO       1.86 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    395.90 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .85 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.9  KILOMETRE/LITRE
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               TABLE                       VEHICLE EMISSION RESULTS
                                       1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.    9        TEST NO. *          DATE 11/ 4/77                   MFGR. CODE    -0                YR.  1975
VEHICLE MODEL  CHEVY NOVA                ENGINE   5.74 LITRE 8           CURB WT.      0 KG              GVM      0 KG

BAROMFTER 746.76 MM OF HG.                                          WET BULB TEMP  16.7 DEG. C
DRY BULB TEMP.    23.9 DEG. C                                        ABS. HUMIDITY   8.9 GRAMS/KG
REL. HUMIDITY     48 PCT.

EXHAUST EMISSIONS
                                                                    BLOWER INLET PRESS., G1 698.5 MM. H2O
     BLOWER DIF. PRESS., G2, *30.3 MM. H2O                          BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                         1               2               3
     BLOWER REVOLUTIONS                            12431           21431           12472
     HC   SAMPLE  METER READING/SCALE             79.8/2          18.5/2          25.4/2
     HC   SAMPLE  PPM                               80              18              25
     HC   BACKGRD METER READING/SCALE             11.2/2          10.4/2          11.5/2
     HC   BACKGRD PPM                               11              10              11
     CO   SAMPLE  METER READING/SCALE             99.3/*          55.4/*          35.2/*
     CO   SAMPLE  PPM                              484              54              32
     CO   BACKGRD METER READING/SCALE               .6/*           1.1/*            .6/*
     CO   BACKGRD PPM                                2               1               1
     CO2  SAMPLE  METER READING/SCALE             91.0/3          55.5/3          78.4/3
     CO2  SAMPLE  PERCENT                         1.70             .97            1.44
     CO2  BACKGRD METER READING/SCALE              3.6/3           3.3/3           4.0/3
     CO2  BACKGRD PERCENT                          .06             .05             .06
     NOX  SAMPLE  METER READING/SCALE             66.0/2          10.9/2          26.0/2
     NOX  SAMPLE  PPM                             66.0            10.9            26.0
     NOX  BACKGRD METER READING/SCALE               .7/2            .5/2            .9/2
     NOX  BACKGRD PPM                               .7              .5              .9
     SO2  SAMPLE  METER READING/SCALE             -0.0/*          -0.0/*          -0.0/*
     SO2  SAMPLE  PPM                             -0.0            -0.0            -0.0
     SO2  BACKGRD METER READING/SCALE             -0.0/*          -0.0/*          -0.0/*
     SO2  BACKGRD PPM                             -0.0            -0.0            -0.0

     HC   CONCENTRATION PPM                         70               9              15
     CO   CONCENTRATION PPM                        459              51              30
     CO2  CONCENTRATION PCT                       1.65             .93            1.38
     NOX  CONCENTRATION PPM                       65.4            10.4            25.2
     SO2  CONCENTRATION PPM                        0.0             0.0             0.0
     HC   MASS GRAMS                              3.52             .77             .76
     CO   MASS GRAMS                             46.57            8.90            3.08
     CO2  MASS GRAMS                           2647.37         2563.84         2223.57
     NOX  MASS GRAMS                             10.30            2.84            3.98
     SO2  MASS GRAMS                              0.00            0.00            0.00

     WEIGHTED MASS HC        .23 GRAMS/KILOMETRE
     WEIGHTED MASS CO       2.54 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    411.82 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .79 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.6  KILOMETRE/LITRE
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                   TABLE                         VEHICLE EMISSION RESULTS
                                             1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  EM9        TEST NO. 1         DATE 11/29/77                  MFGR. CODE    -0               YR.  1975
VEHICLE MODEL   NOVA CHEVROLET          ENGINE   5.74 LITRE 8          CURB WT.      0 KG             GVM     0 KG

BAROMETER 743.46 MM OF HG.                                          WET BULB TEMP  17.8 DEG. C
DRY BULB TEMP.    23.3 DEG. C                                        ABS. HUMIDITY  10.6 GRAMS/KG
REL. HUMIDITY      58 PCT.

EXHAUST EMISSIONS
                                                                    BLOWER INLET PRESS., G1 673.1 MM. H2O
     BLOWER DIF. PRESS., G2, 673.1 MM. H2O                          BLOWER INLET TEMP:    42 DEG. C
     BAG RESULTS
     BAG NO.                                       1              2               3
     BLOWER REVOLUTIONS                          40816          69840           40800
     HC   SAMPLE  METER READING/SCALE            86.6/2         13.0/2           21.4/2
     HC   SAMPLE  PPM                            87             13               21
     HC   BACKGRD METER READING/SCALE            6.7/2          7.3/2            7.8/2
     HC   BACKGRD PPM                            7              7                8
     CO   SAMPLE  METER READING/SCALE            69.8/*         35.5/*           31.6/*
     CO   SAMPLE  PPM                            297            34               30
     CO   BACKGRD METER READING/SCALE            .3/*           .5/*             .5/*
     CO   BACKGRD PPM                            1              0                0
     CO2  SAMPLE  METER READING/SCALE            94.9/3         57.3/3           79.6/3
     CO2  SAMPLE  PERCENT                        1.78           1.01             1.46
     CO2  BACKGRD METER READING/SCALE            3.9/3          3.9/3            4.2/3
     CO2  BACKGRD PERCENT                        .06            .06              .06
     NOX  SAMPLE  METER READING/SCALE            79.5/2         14.2/2           29.4/2
     NOX  SAMPLE  PPM                            79.5           14.2             29.4
     NOX  BACKGRD METER READING/SCALE            1.3/2          1.0/2            1.0/2
     NOX  BACKGRD PPM                            1.3            1.0              1.0
     SO2  SAMPLE  METER READING/SCALE            -0.0/*         -0.0/*           -0.0/*
     SO2  SAMPLE  PPM                            -0.0           -0.0             -0.0
     SO2  BACKGRD METER READING/SCALE            -0.0/*         -0.0/*           -0.0/*
     SO2  BACKGRD PPM                            -0.0           -0.0             -0.0

     HC   CONCENTRATION PPM                      81             6                14
     CO   CONCENTRATION PPM                      281            32               28
     CO2  CONCENTRATION PCT                      1.73           .95              1.40
     NOX  CONCENTRATION PPM                      78.4           13.3             28.5
     SO2  CONCENTRATION PPM                      0.0            0.0              0.0
     HC   MASS GRAMS                             3.60           .48              .64
     CO   MASS GRAMS                             25.24          4.90             2.52
     CO2  MASS GRAMS                           2455.46        2317.71          1992.35
     NOX  MASS GRAMS                             11.53          3.34             4.19
     SO2  MASS GRAMS                             0.00           0.00             0.00

     WEIGHTED MASS HC        .20 GRAMS/KILOMETRE
     WEIGHTED MASS CO       1.42 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    373.66 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .89 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   6.2  KILOMETRE/LITRE
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                    TABLE                  VEHICLE EMISSION RESULTS
                                       1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.   11        TEST NO. *       DATE 11/30/77                       MFGR. CODE    -0                YR.  1975
VEHICLE MODEL  1975 CHEVY NOVA        ENGINE   5.74 LITRE 8               CURB WT.      0 KG              GVM     0 KG

BAROMETER 738.89 MM OF HG.                                             WET BULB TEMP  13.3 DEG. C
DRY BULB TEMP.    23.9 DEG. C                                           ABS. HUMIDITY   5.3 GRAMS/KG
REL. HUMIDITY      28 PCT.

EXHAUST EMISSIONS
                                                                       BLOWER INLET PRESS., G1 647.7 MM. H2O
     BLOWER DIF. PRESS., G2, 635.0 MM. H2O                             BLOWER INLET TEMP.   42 DEG. C
     BAG RESULTS
     BAG NO.                                        1              2              3
     BLOWER REVOLUTIONS                           40668          69793          40611
     HC    SAMPLE  METER READING/SCALE             94.9/2         16.0/2         21.1/2
     HC    SAMPLE  PPM                             95             16             21
     HC    BACKGRD METER READING/SCALE              7.7/2          7.8/2          8.1/2
     HC    BACKGRD PPM                              8              8              8
     CO    SAMPLE  METER READING/SCALE             25.3/3         52.0/*         54.0/*
     CO    SAMPLE  PPM                            587            115             52
     CO    BACKGRD METER READING/SCALE               .1/3          1.2/*          1.6/*
     CO    BACKGRD PPM                              2              2              2
     CO2   SAMPLE  METER READING/SCALE             97.3/3         59.0/3         81.7/3
     CO2   SAMPLE  PERCENT                         1.83           1.04           1.50
     CO2   BACKGRD METER READING/SCALE              4.3/3          4.1/3          3.8/3
     CO2   BACKGRD PERCENT                          .07            .06            .06
     NOX   SAMPLE  METER READING/SCALE             87.0/2         14.5/2         33.0/2
     NOX   SAMPLE  PPM                             87.0           14.5           33.0
     NOX   BACKGRD METER READING/SCALE              1.4/2          1.1/2           .9/2
     NOX   BACKGRD PPM                              1.4            1.1             .9
     SO2   SAMPLE  METER READING/SCALE             -0.0/*         -0.0/*         -0.0/*
     SO2   SAMPLE  PPM                             -0.0           -0.0           -0.0
     SO2   BACKGRD METER READING/SCALE             -0.0/*         -0.0/*         -0.0/*
     SO2   BACKGRD PPM                             -0.0           -0.0           -0.0

     HC    CONCENTRATION PPM                        88              9             14
     CO    CONCENTRATION PPM                       559            110             48
     CO2   CONCENTRATION PCT                       1.77            .99           1.45
     NOX   CONCENTRATION PPM                       85.8           13.5           32.2
     SO2   CONCENTRATION PPM                        0.0            0.0            0.0
     HC    MASS GRAMS                              3.91            .67            .62
     CO    MASS GRAMS                             49.95          16.84           4.31
     CO2   MASS GRAMS                           2506.65        2387.45        2049.41
     NOX   MASS GRAMS                             10.70           2.89           4.01
     SO2   MASS GRAMS                              0.00           0.00           0.00

     WEIGHTED MASS HC        .22 GRAMS/KILOMETRE
     WEIGHTED MASS CO       3.38 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    383.96 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .81 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   6.0  KILOMETRE/LITRE
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                 TABLE                           VEHICLE EMISSION RESULTS
                                            1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.            TEST NO. *          DATE 12/12/77                  MFGR. CODE   -0              YR.  1975
VEHICLE MODEL  NOVA                     ENGINE   5.74 LITRE 8          CURB WT.     0 KG            GVM     0 KG

BAROMETER 743.46 MM OF HG.                                     WET BULB TEMP  16.7 DEG. C
DRY BULB TEMP.   25.6 DEG. C                                    ABS. HUMIDITY   8.3 GRAMS/KG
REL. HUMIDITY     40 PCT.

EXHAUST EMISSIONS
                                                               BLOWER INLET PRESS., G1 647.7 MM. H2O
    BLOWER DIF. PRESS., G2, 647.7 MM. H2O                      BLOWER INLET TEMP.   43 DEG. C
    BAG RESULTS
    BAG NO.                                     1             2             3
    BLOWER REVOLUTIONS                        40689         69843         40662
    HC    SAMPLE  METER READING/SCALE         11.7/3        26.2/2        34.0/2
    HC    SAMPLE  PPM                         117           26            34
    HC    BACKGRD METER READING/SCALE          2.2/3        28.7/2        24.0/2
    HC    BACKGRD PPM                          22           29            24
    CO    SAMPLE  METER READING/SCALE         25.7/3        81.5/*        33.0/*
    CO    SAMPLE  PPM                         596           81            31
    CO    BACKGRD METER READING/SCALE          .1/3          6.9/*         6.7/*
    CO    BACKGRD PPM                           2            7             7
    CO2   SAMPLE  METER READING/SCALE         95.5/3        63.0/3        83.6/3
    CO2   SAMPLE  PERCENT                     1.79          1.12          1.54
    CO2   BACKGRD METER READING/SCALE          4.9/3         4.9/3         4.9/3
    CO2   BACKGRD PERCENT                      .08           .08           .08
    NOX   SAMPLE  METER READING/SCALE         47.0/2        11.0/2        35.3/2
    NOX   SAMPLE  PPM                         47.0          11.0          35.3
    NOX   BACKGRD METER READING/SCALE          1.1/2         1.0/2          .9/2
    NOX   BACKGRD PPM                          1.1           1.0            .9
    SO2   SAMPLE  METER READING/SCALE         -0.0/*        -0.0/*        -0.0/*
    SO2   SAMPLE  PPM                         -0.0          -0.0          -0.0
    SO2   BACKGRD METER READING/SCALE         -0.0/*        -0.0/*        -0.0/*
    SO2   BACKGRD PPM                         -0.0          -0.0          -0.0

    HC    CONCENTRATION PPM                     98            -0            13
    CO    CONCENTRATION PPM                    566            72            24
    CO2   CONCENTRATION PCT                   1.73          1.05          1.48
    NOX   CONCENTRATION PPM                   46.1          10.1          34.5
    SO2   CONCENTRATION PPM                    0.0           0.0           0.0
    HC    MASS GRAMS                          4.36          -.01           .57
    CO    MASS GRAMS                         50.86         11.13          2.17
    CO2   MASS GRAMS                       2453.48       2566.68       2095.70
    NOX   MASS GRAMS                          6.29          2.37          4.71
    SO2   MASS GRAMS                          0.00          0.00          0.00

    WEIGHTED MASS HC       .18 GRAMS/KILOMETRE
    WEIGHTED MASS CO      2.84 GRAMS/KILOMETRE
    WEIGHTED MASS CO2   399.11 GRAMS/KILOMETRE
    WEIGHTED MASS NOX      .64 GRAMS/KILOMETRE
    WEIGHTED MASS SO2     0.00 GRAMS/KILOMETRE

    FUEL ECONOMY BY CARBON BALANCE =   5.8  KILOMETRE/LITRE
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                                   TABLE                        VEHICLE EMISSION RESULTS
                                                              1978  LIGHT DUTY EMISSIONS TEST
                                                          ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.    11       TEST NO.        1      DATE 12/30/77                         MFGR. CODE    -0                      YR.  1975
VEHICLE MODEL  NOVA EM-4                    ENGINE   5.74 LITRE 8                 CURB WT.      0 KG                    GVM     0 KG

BAROMETER 739.65 MM OF HG.
DRY BULB TEMP.    23.3 DEG. C                                                 WET BULB TEMP  17.2 DEG. C
REL. HUMIDITY      54 PCT.                                                     ABS. HUMIDITY  10.0 GRAMS/KG
                                                                               COMMENTS  1978 FTPC
EXHAUST EMISSIONS

    BLOWER DIF. PRESS., G2, 673.1 MM. H20                                     BLOWER INLET PRESS., G1 673.1 MM. H20
    BAG RESULTS                                                                BLOWER INLET TEMP.    42 DEG. C
    BAG NO.                                          1                2                  3
    BLOWER REVOLUTIONS                             40770            69747              40642
    HC    SAMPLE  METER READING/SCALE               12.0/ 3          19.1/ 2            31.8/ 2
    HC    SAMPLE  PPM                              120               19                 32
    HC    BACKGRD METER READING/SCALE                .9/ 3           10.6/ 2            10.8/ 2
    HC    BACKGRD PPM                                9               11                 11
    CO    SAMPLE  METER READING/SCALE               84.6/11           5.4/13            71.4/12
    CO    SAMPLE  PPM                              401                5                162
    CO    BACKGRD METER READING/SCALE                .8/11            3.2/13             1.4/12
    CO    BACKGRD PPM                                2                3                  2
    CO2   SAMPLE  METER READING/SCALE               95.5/ 3          62.4/ 3            85.2/ 3
    CO2   SAMPLE  PERCENT                           1.79             1.11               1.58
    CO2   BACKGRD METER READING/SCALE                3.6/ 3           3.6/ 3             3.7/ 3
    CO2   BACKGRD PERCENT                            .06              .06                .06
    NOX   SAMPLE  METER READING/SCALE               38.6/ 2          13.2/ 2            27.8/ 2
    NOX   SAMPLE  PPM                               38.6             13.2               27.8
    NOX   BACKGRD METER READING/SCALE                .9/ 2            .9/ 2              .9/ 2
    NOX   BACKGRD PPM                                .9               .9                 .9
    SO2   SAMPLE  METER READING/SCALE              -0.0/-0          -0.0/-0            -0.0/-0
    SO2   SAMPLE  PPM                              -0.0             -0.0               -0.0
    SO2   BACKGRD METER READING/SCALE              -0.0/-0          -0.0/-0            -0.0/-0
    SO2   BACKGRD PPM                              -0.0             -0.0               -0.0

    HC    CONCENTRATION PPM                         112                9                 22
    CO    CONCENTRATION PPM                         378                2                152
    CO2   CONCENTRATION PCT                         1.75             1.06               1.53
    NOX   CONCENTRATION PPM                         37.8             12.4               27.0
    SO2   CONCENTRATION PPM                         0.0              0.0                0.0
    HC    MASS GRAMS                                4.96              .71                .98
    CO    MASS GRAMS                               33.74              .34              13.53
    CO2   MASS GRAMS                             2452.17          2546.48            2138.43
    NOX   MASS GRAMS                                5.42             3.03               3.85
    SO2   MASS GRAMS                                0.00             0.00               0.00
    HC GRAMS/KM (GRAMS/MILE)                         .86 (  1.38)      .11 (   .18)      .17 (   .27)
    CO GRAMS/KM (GRAMS/MILE)                        5.82 (  9.36)      .05 (   .09)     2.31 (  3.72)
    CO2 GRAMS/KM (GRAMS/MILE)                     422.74 (680.19)  403.00 (648.43)   365.06 (587.38)
    NOX GRAMS/KM (GRAMS/MILE)                        .93 (  1.50)      .48 (   .77)      .66 (  1.06)
    FUEL CONSUMPTION BY CB  L/100KM (MPG)          18.55 ( 12.68)    17.22 ( 13.66)    15.76 ( 14.93)
    CVS FLOW STD. CU. METRES (SCF)                 76.7 (2708.4)    131.2 (4632.4)     76.4 (2699.4)
    CALCULATED DISTANCE KM(MILES)                   5.80 (  3.61)     6.32 (  3.93)     5.86 (  3.64)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)                 17.09 ( 13.76)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                         .28 (   .45)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                        1.86 (  2.99)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)                     396.66 (638.22)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)                        .62 (  1.00)
    TOTAL CVS FLOW =   289.3 STD. CU. METRES
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              TABLE                    VEHICLE EMISSION RESULTS
                                     1978  LIGHT DUTY EMISSIONS TEST
                                  ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM9       TEST NO.    1     DATE  1/16/78                    MFGR. CODE   -0                 YR.  1975
VEHICLE MODEL  NOVA CHEVY             ENGINE   5.74 LITRE 8            CURB WT.      0 KG              GVW     0 KG

BAROMETER 739.14 MM OF HG.
DRY BULB TEMP.    23.3 DEG. C                                   WET BULB TEMP  18.3 DEG. C
REL. HUMIDITY      62 PCT.                                       ABS. HUMIDITY  11.4 GRAMS/KG
                                                                 COMMENTS  1978 FTP-C
EXHAUST EMISSIONS

    BLOWER DIF. PRESS., G2, 673.1 MM. H2O                       BLOWER INLET PRESS., G1 673.1 MM. H2O
    BAG RESULTS                                                  BLOWER INLET TEMP.   41 DEG. C
    BAG NO.                                       1                 2                 3
    BLOWER REVOLUTIONS                        40732             69822             40684
    HC   SAMPLE  METER READING/SCALE          84.3/ 2           17.3/ 2           27.6/ 2
    HC   SAMPLE  PPM                            84                17                28
    HC   BACKGRD METER READING/SCALE          12.2/ 2           11.9/ 2           10.8/ 2
    HC   BACKGRD PPM                            12                12                11
    CO   SAMPLE  METER READING/SCALE          70.1/11           28.3/13           20.6/13
    CO   SAMPLE  PPM                           299                27                20
    CO   BACKGRD METER READING/SCALE           8.6/11           23.9/13           11.8/13
    CO   BACKGRD PPM                            27                23                11
    CO2  SAMPLE  METER READING/SCALE          97.1/ 3           63.2/ 3           85.3/ 3
    CO2  SAMPLE  PERCENT                      1.83              1.13              1.58
    CO2  BACKGRD METER READING/SCALE           3.1/ 3            3.9/ 3            4.2/ 3
    CO2  BACKGRD PERCENT                       .05               .06               .06
    NOX  SAMPLE  METER READING/SCALE          29.6/ 2           11.1/ 2           25.4/ 2
    NOX  SAMPLE  PPM                          29.6              11.1              25.4
    NOX  BACKGRD METER READING/SCALE            .6/ 2             .6/ 2             .7/ 2
    NOX  BACKGRD PPM                            .6                .6                .7
    SO2  SAMPLE  METER READING/SCALE         -0.0/-0           -0.0/-0           -0.0/-0
    SO2  SAMPLE  PPM                         -0.0              -0.0              -0.0
    SO2  BACKGRD METER READING/SCALE         -0.0/-0           -0.0/-0           -0.0/-0
    SO2  BACKGRD PPM                         -0.0              -0.0              -0.0

    HC   CONCENTRATION PPM                      74                 6                18
    CO   CONCENTRATION PPM                     260                 5                 9
    CO2  CONCENTRATION PCT                    1.79              1.07              1.52
    NOX  CONCENTRATION PPM                    29.1              10.6              24.8
    SO2  CONCENTRATION PPM                     0.0               0.0               0.0
    HC   MASS GRAMS                           3.27               .49               .80
    CO   MASS GRAMS                          23.25               .82               .79
    CO2  MASS GRAMS                        2512.19           2583.75           2138.94
    NOX  MASS GRAMS                           4.77              2.72              3.72
    SO2  MASS GRAMS                           0.00              0.00              0.00
    HC GRAMS/KM (GRAMS/MILE)                   .56 (   .90)      .08 (   .12)      .14 (   .22)
    CO GRAMS/KM (GRAMS/MILE)                  3.99 (  6.42)      .13 (   .21)      .13 (   .22)
    CO2 GRAMS/KM (GRAMS/MILF)               431.09 (693.63)   407.52 (655.71)   367.35 (591.06)
    NOX GRAMS/KM (GRAMS/MILE)                  .75 (  1.21)      .43 (   .69)      .64 (  1.03)
    FUEL CONSUMPTION BY CB  L/100KM (MPG)    16.74 ( 12.55)    17.41 ( 13.51)    15.71 ( 14.98)
    CVS FLOW STD. CU. METRES (SCF)            76.8 (2712.0)    131.6 (4648.3)     76.7 (2708.5)
    CALCULATED DISTANCE KM(MILES)             5.83 (  3.62)     6.34 (  3.94)     5.82 (  3.62)

 EIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)          17.22 ( 13.66)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                  .19 (   .31)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                  .93 (  1.49)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)              401.41 (645.87)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)                 .55 (   .89)
    TOTAL CVS FLOW =    285.1 STD. CU. METRES
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                      TABLE              VEHICLE EMISSION RESULTS
                                        1978  LIGHT DUTY EMISSIONS TEST
                                      ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM9      TEST NO.      1     DATE  1/18/78                  MFGR. CODE   -0              YR.  1975
VEHICLE MODEL  NOVA CHEVY              ENGINE   5.74 LITRE 8           CURB WT.     0 KG            GVM     0 KG

BAROMETER 742.19 MM OF HG.
DRY BULB TEMP.   22.2 DEG. C                                        WET BULB TEMP  11.1 DEG. C
REL. HUMIDITY     22 PCT.                                            ABS. HUMIDITY   3.7 GRAMS/KG
                                                                     COMMENTS  1978-FTP-C
EXHAUST EMISSIONS

    BLOWER DIF. PRESS., G2, 673.1 MM. H2O                           BLOWER INLET PRESS., G1 673.1 MM. H2O
    BAG RESULTS                                                     BLOWER INLET TEMP.    43 DEG. C
    BAG NO.                                  1               2               3
    BLOWER REVOLUTIONS                     40662           69734           40625
    HC   SAMPLE  METER READING/SCALE       65.3/ 2         16.3/ 2         33.4/ 2
    HC   SAMPLE  PPM                       65              16              33
    HC   BACKGRD METER READING/SCALE        9.8/ 2          9.0/ 2          9.7/ 2
    HC   BACKGRD PPM                       10               9              10
    CO   SAMPLE  METER READING/SCALE       62.7/11          7.4/13         25.1/13
    CO   SAMPLE  PPM                      255               7              24
    CO   BACKGRD METER READING/SCALE         .6/11          1.8/13          1.8/13
    CO   BACKGRD PPM                        2               2               2
    CO2  SAMPLE  METER READING/SCALE       42.6/ 2         62.2/ 3         85.3/ 3
    CO2  SAMPLE  PERCENT                   1.88            1.11            1.58
    CO2  BACKGRD METER READING/SCALE        1.9/ 2          3.3/ 3          3.6/ 3
    CO2  BACKGRD PERCENT                    .07             .05             .06
    NOX  SAMPLE  METER READING/SCALE       38.7/ 2         14.0/ 2         33.0/ 2
    NOX  SAMPLE  PPM                       38.7            14.0            33.0
    NOX  BACKGRD METER READING/SCALE        1.1/ 2           .5/ 2           .6/ 2
    NOX  BACKGRD PPM                        1.1              .5              .6
    SO2  SAMPLE  METER READING/SCALE       -0.0/-0         -0.0/-0         -0.0/-0
    SO2  SAMPLE  PPM                       -0.0            -0.0            -0.0
    SO2  BACKGRD METER READING/SCALE       -0.0/-0         -0.0/-0         -0.0/-0
    SO2  BACKGRD PPM                       -0.0            -0.0            -0.0

    HC   CONCENTRATION PPM                  57               8              25
    CO   CONCENTRATION PPM                 243               5              21
    CO2  CONCENTRATION PCT                 1.82            1.06            1.53
    NOX  CONCENTRATION PPM                 37.8            13.5            32.5
    SO2  CONCENTRATION PPM                  0.0             0.0             0.0
    HC   MASS GRAMS                        2.52             .61            1.10
    CO   MASS GRAMS                       21.66             .82            1.91
    CO2  MASS GRAMS                     2551.93         2553.69         2148.31
    NOX  MASS GRAMS                        4.50            2.77            3.87
    SO2  MASS GRAMS                        0.00            0.00            0.00
    HC GRAMS/KM (GRAMS/MILE)               .43 (   .70)     .10 (   .16)     .19 (   .30)
    CO GRAMS/KM (GRAMS/MILE)              3.72 (  5.98)     .13 (   .21)     .33 (   .52)
    CO2 GRAMS/KM (GRAMS/MILE)           438.17 (705.02)  403.79 (649.70)  366.92 (590.37)
    NOX GRAMS/KM (GRAMS/MILE)              .77 (  1.24)     .44 (   .70)     .66 (  1.06)
    FUEL CONSUMPTION BY CB  L/100KM (MPG) 19.01 ( 12.37)  17.26 ( 13.63)  15.71 ( 14.98)
    CVS FLOW STD. CU. METRES (SCF)        76.7 (2708.4)   131.5 (4644.4)    76.6 (2705.8)
    CALCULATED DISTANCE KM(MILES)         5.82 (  3.62)    6.32 (  3.93)    5.86 (  3.64)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)       17.19 ( 13.68)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)               .19 (   .31)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)               .92 (  1.49)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)           400.77 (644.84)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)              .57 (   .91)
   TOTAL CVS FLOW =   284.9 STD. CU. METRES
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                     TABLE                 VEHICLE EMISSION RESULTS
                                        1978  LIGHT DUTY EMISSIONS TEST
                                     ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM9      TEST NO.     1      DATE  2/28/78                    MFGR. CODE   -0              YR.  1975
VEHICLE MODEL  NOVA CHEVY              ENGINE   5.74 LITRE 8            CURB WT.     0 KG            GVW     0 KG

BAROMETER 738.63 MM OF HG.                                          WET BULB TEMP  18.9 DEG. C
DRY BULB TEMP.   22.2 DEG. C                                         ABS. HUMIDITY  12.6 GRAMS/KG
REL. HUMIDITY     73 PCT.                                            COMMENTS  1978 FTP-C

EXHAUST EMISSIONS
                                                                    BLOWER INLET PRESS., G1 736.6 MM. H2O
   RLOWER DIF. PRESS., G2, 736.6 MM. H2O                            BLOWER INLET TEMP.    43 DEG. C
   RAG RESULTS
   RAG NO.                                     1           2            3
   RLOWER REVOLUTIONS                        40618       69650        40612
   HC   SAMPLE  METER READING/SCALE          84.3/ 2      21.0/ 2      36.3/ 2
   HC   SAMPLE  PPM                          84           21           36
   HC   BACKGRD METER READING/SCALE          12.0/ 2      13.5/ 2      19.5/ 2
   HC   BACKGRD PPM                          12           13           19
   CO   SAMPLE  METER READING/SCALE          72.6/11      17.5/13      66.8/12
   CO   SAMPLE  PPM                          315          17           150
   CO   BACKGRD METER READING/SCALE          .7/11        1.6/13       .6/12
   CO   RACKGRD PPM                          2            2            1
   CO2  SAMPLE  METER READING/SCALE          46.4/ 2      72.3/ 3      94.2/ 3
   CO2  SAMPLE  PERCENT                      2.08         1.31         1.77
   CO2  BACKGRD METER READING/SCALE          1.7/ 2       4.0/ 3       3.1/ 3
   CO2  RACKGRD PERCENT                      .06          .06          .05
   NOX  SAMPLE  METER READING/SCALE          23.9/ 2      9.3/ 2       17.6/ 2
   NOX  SAMPLE  PPM                          23.9         9.3          17.6
   NOX  BACKGRD METER READING/SCALE          .8/ 2        .5/ 2        .6/ 2
   NOX  RACKGRD PPM                          .8           .5           .6
   SO2  SAMPLE  METER READING/SCALE          -0.0/-0      -0.0/-0      -0.0/-0
   SO2  SAMPLE  PPM                          -0.0         -0.0         -0.0
   SO2  RACKGRD METER READING/SCALE          -0.0/-0      -0.0/-0      -0.0/-0
   SO2  RACKGRD PPM                          -0.0         -0.0         -0.0

   HC   CONCENTRATION PPM                    74           9            19
   CO   CONCENTRATION PPM                    293          15           141
   CO2  CONCENTRATION PCT                    2.03         1.26         1.73
   NOX  CONCENTRATION PPM                    23.2         8.8          17.1
   SO2  CONCENTRATION PPM                    0.0          0.0          0.0
   HC   MASS GRAMS                           3.23         .66          .84
   CO   MASS GRAMS                           25.79        2.19         12.38
   CO2  MASS GRAMS                         2806.01      2976.51      2384.50
   NOX  MASS GRAMS                           3.58         2.34         2.63
   SO2  MASS GRAMS                           0.00         0.00         0.00
   HC GRAMS/KM (GRAMS/MILE)                 .55 (   .89)    .10 (   .17)    .15 (   .23)
   CO GRAMS/KM (GRAMS/MILE)                4.41 (  7.10)    .34 (   .55)   2.13 (  3.42)
   CO2 GRAMS/KM (GRAMS/MILE)             479.98 (772.29) 468.61 (753.99) 409.76 (659.30)
   NOX GRAMS/KM (GRAMS/MILE)                .61 (   .98)    .37 (   .59)    .45 (   .73)
   FUEL CONSUMPTION RY CB  L/100KM (MPG)  20.86 ( 11.28)  20.04 ( 11.74)  17.65 ( 13.33)
   CVS FLOW STD. CU. METRES (SCF)          75.5 (2666.2)  129.4 (4571.5)   75.5 (2665.6)
   CALCULATED DISTANCE KM(MILES)           5.85 (  3.63)   6.35 (  3.95)   5.82 (  3.62)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)        19.56 ( 12.03)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                .21 (   .33)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)               1.67 (  2.68)
WEIGHTFD MASS CO2 GRAMS/KM (GRAMS/MILE)            454.91 (731.96)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)               .44 (   .71)
    TOTAL CVS FLOW =   280.5 STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER EM9

 DATE  2/28/78                 TIME    -0 HRS.        TEST NO.  2
 MODEL  1975 NOVA CHEVY        SET-7                  ENGINE 5.7 LITREV 8
 DRIVER   BP                   TEST WT.  1814 KG.     GVW    0 KG
 WET BULB TEMP  19 C           DRY BULB TEMP  25 C    REL. HUM.  56.1 PCT
 SPEC. HUM.  11.4 GRAM/KG      BARO.  738.4 MM  HG.   MEASURED FUEL  0.00 KG

   RUN DURATION          23.23 MINUTES
   BLOWER INLET PRESS. 736.6  MM. H2O
   BLOWER DIF.  PRESS. 736.6  MM  H2O
   BLOWER INLET TEMP.      44  DEG. C
   DYNO REVOLUTIONS    31583
   BLOWER REVOLUTIONS   111934
   BLOWER CU. CM /REV.  2231

   BAG RESULTS
    HC  SAMPLE  METER READING/SCALE              25.3/2
    HC  SAMPLE  PPM                                25
    HC  BACKGRD METER READING/SCALE              14.4/2
    HC  BACKGRD PPM                                14
    CO  SAMPLE  METER READING/SCALE              80.9/*
    CO  SAMPLE  PPM                               187
    CO  BACKGRD METER READING/SCALE                .5/*
    CO  BACKGRD PPM                                 1
    CO2 SAMPLE  METER READING/SCALE              45.9/2
    CO2 SAMPLE  PERCENT                          2.05
    CO2 BACKGRD METER READING/SCALE               1.7/2
    CO2 BACKGRD PERCENT                           .06
    NOX SAMPLE  METER READING/SCALE              26.1/2
    NOX SAMPLE  PPM                              26.1
    NOX BACKGRD METER READING/SCALE                .8/2
    NOX BACKGRD PPM                                .8
    HC  CONCENTRATION PPM                          13
    CO  CONCENTRATION PPM                         176
    CO2 CONCENTRATION PCT                        2.00
    NOX CONCENTRATION PPM                        25.4
    SO2 COCENTRATION PPM                         0.0
    HC  MASS (GRAMS)                             1.57
    CO  MASS (GRAMS)                            42.50
    CO2 MASS (GRAMS)                          7641.20
    NOX MASS (GRAMS)                            10.33
    SO2 MASS (GRAMS)                             0.00

 HC  GRAMS/KILOMETRE       .07
 CO  GRAMS/KILOMETRE      1.95
 CO2 GRAMS/KILOMETRE    351
 NOX GRAMS/KILOMETRE       .47
 SO2 GRAMS/KILOMETRE      0.00

 HC  GRAMS/KG OF FUEL    .65     HC  GRAMS/MIN    .07
 CO  GRAMS/KG OF FUEL   17.5     CO  GRAMS/MIN    1.8
 CO2 GRAMS/KG OF FUEL   3190     CO2 GRAMS/MIN    329
 NOX GRAMS/KG OF FUEL   4.24     NOX GRAMS/MIN    .44
 SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
 CARBON BALANCE FUEL ECONOMY =   15.14 LITRES PER HUNDRED KILOMETERS
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        TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER EM9

DATE  2/28/78               TIME    -0 HRS.         TEST NO.  2
MODEL  1975 NOVA CHEVY      SET-7                   ENGINE 5.7 LITREO
RUN DURATION   23.23 MIN.  DISTANCE DRIVEN  21.78 KILOMETRES
CVS BLOWER TEST VOL.  249.76 ACT. CU. METRES

                            SAMPLE                  BACKGROUND
SULFATE DATA                ------                  ----------

 FILTER NO.              47FH-2896
 SAMPLE VOL. CU. FT.         16.26                      1.00
 SAMPLE TEMP. DEG. F            81                        70
 SAMPLE AREA SQ. IN.     221520.00                      0.00
 DILUTION FACTOR                 1                         1
 STAND. DEN. MICROG/ML        5.00                      1.00
 STAND. AREA SQ. IN.     144075.00                      1.00
 SO4,MICROG/FILTER          76.877                     0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                      1.00
 SAMPLE TEMP. DEG. F            70                        70
 AREA,BUBBLER 1               0.00                      0.00
 DIL. FACT.,BUBBLER 1            1                         1
 AREA,BUBBLER 2               0.00                      0.00
 DIL. FACT.,BUBBLER 2            1                         1
 STAND. DEN. MICROG/ML        1.00                      1.00
 STAND. AREA,SQ. IN.          1.00                      1.00
 SO2, MILLIG/BUBBLER 1       0.000                     0.000
 SO2, MILLIG/BUBBLER 2       0.000                     0.000
 SO2, PPM                      0.0                       0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST           47.575
 NET H2SO4,MILLIGRAM/TEST             48.574
 NET SO2,GRAM/TEST                     0.000
 NET SULFATE,MILLIGRAM/KILOMETRE       2.185
 NET H2SO4,MILLIGRAM/KILOMETRE         2.231
 NET SO2,GRAM/KILOMETRE                0.000

SULFUR BALANCE
 FUEL WT., 2434 GRAMS     SULFUR IN FUEL, .0310 PCT.
                            FUEL     SO2        H2SO4       SO2 + H2SO4
                            ----    -----      -------      -----------
          SULFUR,GRAMS      .75     0.000       .0159           .0159
          PCT. RECOVERY              0.00        2.11            2.11
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EM9

DATE  2/28/78                TIME     -0 HRS.          TEST NO.  3
MODEL  1975 NOVA CHEVY       FET EM-9                  ENGINE 5.7 LITREV 8
DRIVER   BP                  TEST WT.  1814 KG.        GVW    0 KG
WET BULB TEMP  18 C          DRY BULB TEMP  26 C       REL. HUM.  49.7 PCT
SPEC. HUM.  10.4 GRAM/KG     BARO.  738.4 MM  HG.      MEASURED FUEL  0.00 KG

  RUN DURATION          12.76 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H2O
  BLOWER DIF.  PRESS. 736.6  MM  H2O
  BLOWER INLET TEMP.      44  DEG. C
  DYNO REVOLUTIONS     23715
  BLOWER REVOLUTIONS     61545
  BLOWER CU. CM /REV.  2231

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE            22.4/2
   HC   SAMPLE  PPM                              22
   HC   BACKGRD METER READING/SCALE            12.8/2
   HC   BACKGRD PPM                              13
   CO   SAMPLE  METER READING/SCALE            68.1/*
   CO   SAMPLE  PPM                              66
   CO   BACKGRD METER READING/SCALE             1.1/*
   CO   BACKGRD PPM                               1
   CO2 SAMPLE  METER READING/SCALE             55.1/2
   CO2 SAMPLE  PERCENT                         2.58
   CO2 BACKGRD METER READING/SCALE              1.7/2
   CO2 BACKGRD PERCENT                          .06
   NOX SAMPLE  METER READING/SCALE             38.2/2
   NOX SAMPLE  PPM                             38.2
   NOX BACKGRD METER READING/SCALE               .8/2
   NOX BACKGRD PPM                               .8
   HC   CONCENTRATION PPM                        12
   CO   CONCENTRATION PPM                        61
   CO2 CONCENTRATION PCT                       2.53
   NOX CONCENTRATION PPM                       37.6
   SO2 COCENTRATION PPM                        0.0
   HC   MASS (GRAMS)                            .79
   CO   MASS (GRAMS)                           8.12
   CO2 MASS (GRAMS)                         5304.50
   NOX MASS (GRAMS)                            8.12
   SO2 MASS (GRAMS)                            0.00

HC   GRAMS/KILOMETRE       .05
CO   GRAMS/KILOMETRE       .50
CO2 GRAMS/KILOMETRE    324
NOX GRAMS/KILOMETRE       .50
SO2 GRAMS/KILOMETRE      0.00

HC   GRAMS/KG OF FUEL     .47     HC   GRAMS/MIN    .06
CO   GRAMS/KG OF FUEL     4.8     CO   GRAMS/MIN     .6
CO2 GRAMS/KG OF FUEL    3160     CO2 GRAMS/MIN    416
NOX GRAMS/KG OF FUEL    4.84     NOX GRAMS/MIN    .64
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   13.91 LITRES PER HUNDRED KILOMETERS
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                        TABLE                    VEHICLE EMISSION RESULTS
                                               1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  EM9         TEST NO. 1          DATE  3/ 2/78                   MFGR. CODE   -0                  YR.  1975
VEHICLE MODEL  NOVA CHEVY                 ENGINE   5.74 LITRE 8           CURB WT.     0 KG                GVM     0 KG

BAROMETER 738.12 MM OF HG.                                               WET BULB TEMP  15.6 DEG. C
DRY BULB TEMP.   20.6 DEG. C                                              ABS. HUMIDITY   9.2 GRAMS/KG
REL. HUMIDITY     59 PCT.

EXHAUST EMISSIONS
                                                                        BLOWER INLET PRESS., G1 736.6 MM. H2O
     BLOWER DIF. PRESS., G2, 736.6 MM. H2O                              BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                      1            2            3
     BLOWER REVOLUTIONS                         40585        69585        40592
     HC    SAMPLE  METER READING/SCALE          67.6/2       21.8/2       31.5/2
     HC    SAMPLE  PPM                          68           22           31
     HC    BACKGRD METER READING/SCALE          13.0/2       13.6/2       11.8/2
     HC    BACKGRD PPM                          13           14           12
     CO    SAMPLE  METER READING/SCALE          65.7/*       22.0/*       76.2/*
     CO    SAMPLE  PPM                          272          21           75
     CO    BACKGRD METER READING/SCALE          2.1/*        4.6/*        2.2/*
     CO    BACKGRD PPM                          6            4            2
     CO2   SAMPLE  METER READING/SCALE          46.3/2       72.4/3       94.8/3
     CO2   SAMPLE  PERCENT                      2.08         1.31         1.78
     CO2   BACKGRD METER READING/SCALE          1.9/2        4.2/3        3.7/3
     CO2   BACKGRD PERCENT                      .07          .06          .06
     NOX   SAMPLE  METER READING/SCALE          31.6/2       9.9/2        21.0/2
     NOX   SAMPLE  PPM                          31.6         9.9          21.0
     NOX   BACKGRD METER READING/SCALE          .4/2         .4/2         .3/2
     NOX   BACKGRD PPM                          .4           .4           .3
     SO2   SAMPLE  METER READING/SCALE          -0.0/*       -0.0/*       -0.0/*
     SO2   SAMPLE  PPM                          -0.0         -0.0         -0.0
     SO2   BACKGRD METER READING/SCALE          -0.0/*       -0.0/*       -0.0/*
     SO2   BACKGRD PPM                          -0.0         -0.0         -0.0

     HC    CONCENTRATION PPM                    57           10           21
     CO    CONCENTRATION PPM                    251          16           69
     CO2   CONCENTRATION PCT                    2.02         1.26         1.73
     NOX   CONCENTRATION PPM                    31.3         9.5          20.7
     SO2   CONCENTRATION PPM                    0.0          0.0          0.0
     HC    MASS GRAMS                           2.46         .71          .92
     CO    MASS GRAMS                           22.03        2.41         6.08
     CO2   MASS GRAMS                          2797.13      2982.19      2398.11
     NOX   MASS GRAMS                           4.29         2.25         2.85
     SO2   MASS GRAMS                           0.00         0.00         0.00

     WEIGHTED MASS HC        .19 GRAMS/KILOMETRE
     WEIGHTED MASS CO       1.27 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    460.07 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .47 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.1  KILOMETRE/LITRE
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER EM9

DATE  3/ 2/78             TIME     -0 HRS.          TEST NO.  2
MODEL  1975 NOVA CHEVY    SET 7                     ENGINE 5.7 LITREV 8
DRIVER   BP               TEST WT.  1814 KG.        GVW    0 KG
WET BULB TEMP  16 C       DRY BULB TEMP  21 C       REL. HUM.  59.9 PCT
SPEC. HUM.   9.6 GRAM/KG  BARO.  737.1 MM  HG.      MEASURED FUEL  0.00 KG

  RUN DURATION          23.28 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H20
  BLOWER DIF.  PRESS. 736.6  MM  H20
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    31829
  BLOWER REVOLUTIONS   112237
  BLOWER CU. CM /REV.  2228

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE            21.0/2
   HC  SAMPLE  PPM                              21
   HC  BACKGRD METER READING/SCALE             9.4/2
   HC  BACKGRD PPM                               9
   CO  SAMPLE  METER READING/SCALE            69.4/*
   CO  SAMPLE  PPM                             157
   CO  BACKGRD METER READING/SCALE              .6/*
   CO  BACKGRD PPM                               1
   CO2 SAMPLE  METER READING/SCALE            45.1/2
   CO2 SAMPLE  PERCENT                        2.01
   CO2 BACKGRD METER READING/SCALE             1.8/2
   CO2 BACKGRD PERCENT                         .07
   NOX SAMPLE  METER READING/SCALE            28.0/2
   NOX SAMPLE  PPM                            28.0
   NOX BACKGRD METER READING/SCALE              .5/2
   NOX BACKGRD PPM                              .5
   HC  CONCENTRATION PPM                        13
   CO  CONCENTRATION PPM                       147
   CO2 CONCENTRATION PCT                      1.96
   NOX CONCENTRATION PPM                      27.6
   SO2 COCENTRATION PPM                       0.0
   HC  MASS (GRAMS)                           1.56
   CO  MASS (GRAMS)                          35.58
   CO2 MASS (GRAMS)                        7482.68
   NOX MASS (GRAMS)                          10.60
   SO2 MASS (GRAMS)                           0.00

HC  GRAMS/KILOMETRE      .07
CO  GRAMS/KILOMETRE     1.62
CO2 GRAMS/KILOMETRE   341
NOX GRAMS/KILOMETRE      .48
SO2 GRAMS/KILOMETRE     0.00

HC  GRAMS/KG OF FUEL    .66     HC  GRAMS/MIN    .07
CO  GRAMS/KG OF FUEL   15.0     CO  GRAMS/MIN    1.5
CO2 GRAMS/KG OF FUEL   3144     CO2 GRAMS/MIN    321
NOX GRAMS/KG OF FUEL   4.45     NOX GRAMS/MIN    .46
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   14.69 LITRES PER HUNDRED KILOMETERS
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EM9

DATE  3/ 2/78                 TIME    -0 HRS.        TEST NO.  2
MODEL  1975 NOVA CHEVY        SET 7                  ENGINE 5.7 LITREO
RUN DURATION   23.28 MIN.  DISTANCE DRIVEN  21.95 KILOMETRES
CVS BLOWER TEST VOL.  250.03 ACT. CU. METRES

                              SAMPLE                 BACKGROUND
SULFATE DATA                  ------                 ----------

 FILTER NO.                 47FH-2895
 SAMPLE VOL. CU. FT.           16.54                      1.00
 SAMPLE TEMP. DEG. F              78                        70
 SAMPLE AREA SQ. IN.        80917.00                      0.00
 DILUTION FACTOR                   1                         1
 STAND. DEN. MICROG/ML         20.00                      1.00
 STAND. AREA SQ. IN.       170105.00                      1.00
 SO4,MICROG/FILTER            95.138                     0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.            1.00                      1.00
 SAMPLE TEMP. DEG. F              70                        70
 AREA,BUBBLER 1                 0.00                      0.00
 DIL. FACT.,BUBBLER 1              1                         1
 AREA,BUBBLER 2                 0.00                      0.00
 DIL. FACT.,BUBBLER 2              1                         1
 STAND. DEN. MICROG/ML          1.00                      1.00
 STAND. AREA,SQ. IN.            1.00                      1.00
 SO2, MILLIG/BUBBLER 1         0.000                     0.000
 SO2, MILLIG/BUBBLER 2         0.000                     0.000
 SO2, PPM                        0.0                       0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST              58.085
 NET H2SO4,MILLIGRAM/TEST                59.304
 NET SO2,GRAM/TEST                        0.000
 NET SULFATE,MILLIGRAM/KILOMETRE          2.647
 NET H2SO4,MILLIGRAM/KILOMETRE            2.702
 NET SO2,GRAM/KILOMETRE                   0.000

SULFUR BALANCE
 FUEL WT., 2380 GRAMS      SULFUR IN FUEL, .0310 PCT.
                             FUEL      SO2      H2SO4      SO2 + H2SO4
                             ----     -----    -------    -----------
          SULFUR,GRAMS        .74     0.000     .0194          .0194
          PCT. RECOVERY               0.00       2.63           2.63
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EM9    .

DATE  3/ 2/78              TIME    -0 HRS.        TEST NO.  3
MODEL  1975 NOVA CHEVY     FET                    ENGINE 5.7 LITREV 8
DRIVER   BP                TEST WT.  1814 KG.     GVW    0 KG
WET BULB TEMP  17 C        DRY BULB TEMP  23 C    REL. HUM.  54.4 PCT
SPFC. HUM.  10.0 GRAM/KG   BARO.  737.1 MM  HG.   MEASURED FUEL  0.00 KG

  RUN DURATION          12.76 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H20
  BLOWER DIF.  PRESS. 736.6  MM  H20
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    23810
  BLOWER REVOLUTIONS    61531
  BLOWER CU. CM /REV.  2229

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE            20.2/2
   HC   SAMPLE  PPM                              20
   HC   BACKGRD METER READING/SCALE             9.8/2
   HC   BACKGRD PPM                              10
   CO   SAMPLE  METER READING/SCALE            96.6/*
   CO   SAMPLE  PPM                              98
   CO   BACKGRD METER READING/SCALE              .6/*
   CO   BACKGRD PPM                               1
   CO2 SAMPLE  METER READING/SCALE             54.4/2
   CO2 SAMPLE  PERCENT                         2.54
   CO2 BACKGRD METER READING/SCALE              1.8/2
   CO2 BACKGRD PERCENT                          .07
   NOX SAMPLE  METER READING/SCALE             39.1/2
   NOX SAMPLE  PPM                             39.1
   NOX BACKGRD METER READING/SCALE               .8/2
   NOX BACKGRD PPM                               .8
   HC  CONCENTRATION PPM                        12
   CO  CONCENTRATION PPM                        91
   CO2 CONCENTRATION PCT                       2.48
   NOX CONCENTRATION PPM                       38.5
   SO2 COCENTRATION PPM                        0.0
   HC  MASS (GRAMS)                             .81
   CO  MASS (GRAMS)                           12.14
   CO2 MASS (GRAMS)                         5205.14
   NOX MASS (GRAMS)                            8.20
   SO2 MASS (GRAMS)                            0.00

HC  GRAMS/KILOMETRE       .05
CO  GRAMS/KILOMETRE       .74
CO2 GRAMS/KILOMETRE    316
NOX GRAMS/KILOMETRE       .50
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL     .49     HC  GRAMS/MIN     .06
CO  GRAMS/KG OF FUEL    7.4      CO  GRAMS/MIN    1.0
CO2 GRAMS/KG OF FUEL   3156      CO2 GRAMS/MIN    408
NOX GRAMS/KG OF FUEL   4.97      NOX GRAMS/MIN     .64
SO2 GRAMS/KG OF FUEL   0.00      SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   13.56 LITRES PER HUNDRED KILOMETERS
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                          TABLE                           VEHICLE EMISSION RESULTS
                                                     1975  LIGHT DUTY EMISSIONS TEST
                                                                         MFGR. CODE    -0                     YR.  1975
UNIT NO.     9          TEST NO. 1          DATE  3/29/78                CURB WT.      0 KG                   GVM     0 KG
VEHICLE MODEL  CHEVY  NOVA                  ENGINE   5.74 LITRE 8

                                                                    WET BULB TEMP  11.1 DEG. C
BAROMETER 744.98 MM OF HG.                                           ABS. HUMIDITY   2.7 GRAMS/KG
DRY BULB TEMP.    24.4 DEG. C
REL. HUMIDITY      14 PCT.

EXHAUST EMISSIONS                                                   BLOWER INLET PRESS., G1 762.0 MM. H2O
                                                                    BLOWER INLET TEMP.    43 DEG. C
    BLOWER DIF. PRESS., G2, 762.0 MM. H2O
    BAG RESULTS
    BAG NO.                                         1               2               3
    BLOWER REVOLUTIONS                          40609           69534           40600
    HC   SAMPLE  METER READING/SCALE            83.2/2           23.8/2          30.7/2
    HC   SAMPLE  PPM                              83             23.8            30.7
    HC   BACKGRD METER READING/SCALE            11.6/2           10.7/2          11.0/2
    HC   BACKGRD PPM                              12             10.7            11.0
    CO   SAMPLE  METER READING/SCALE            68.5/*           91.3/*          22.9/*
    CO   SAMPLE  PPM                             289              92              22
    CO   BACKGRD METER READING/SCALE             2.0/*            4.3/*           1.7/*
    CO   BACKGRD PPM                               6               4               2
    CO2  SAMPLE  METER READING/SCALE            43.5/2           65.3/3          85.3/3
    CO2  SAMPLE  PERCENT                        1.92             1.17            1.58
    CO2  BACKGRD METER READING/SCALE             1.9/2            3.7/3           3.0/3
    CO2  BACKGRD PERCENT                         .07              .06             .05
    NOX  SAMPLE  METER READING/SCALE            40.8/2            9.7/2          24.7/2
    NOX  SAMPLE  PPM                            40.8              9.7            24.7
    NOX  BACKGRD METER READING/SCALE             1.2/2            .8/2            .6/2
    NOX  BACKGRD PPM                             1.2              .8              .6
    SO2  SAMPLE  METER READING/SCALE            -0.0/*           -0.0/*          -0.0/*
    SO2  SAMPLE  PPM                            -0.0             -0.0            -0.0
    SO2  BACKGRD METER READING/SCALE            -0.0/*           -0.0/*          -0.0/*
    SO2  BACKGRD PPM                            -0.0             -0.0            -0.0

    HC   CONCENTRATION PPM                        73             14.1            21.0
    CO   CONCENTRATION PPM                       272              86              20
    CO2  CONCENTRATION PCT                      1.87             1.12            1.54
    NOX  CONCENTRATION PPM                      39.8              9.0            24.2
    SO2  CONCENTRATION PPM                       0.0              0.0             0.0
    HC   MASS GRAMS                             3.21             1.054           0.920
    CO   MASS GRAMS                            24.05            13.01            1.73
    CO2  MASS GRAMS                          2604.18          2670.59         2148.62
    NOX  MASS GRAMS                             4.58             1.77            2.78
    SO2  MASS GRAMS                             0.00             0.00            0.00

    WEIGHTED MASS HC       (0.39)
    WEIGHTED MASS CO        2.02 GRAMS/KILOMETRE
    WEIGHTED MASS CO2     415.59 GRAMS/KILOMETRE
    WEIGHTED MASS NOX        .44 GRAMS/KILOMETRE
    WEIGHTED MASS SO2       0.00 GRAMS/KILOMETRE

    FUEL ECONOMY BY CARBON BALANCE =   5.5  KILOMETRE/LITRE
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     TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER EM9

DATE  3/29/78              TIME    -0 HRS.        TEST NO.  2
MODEL  1975 CHEVY NOVA     SET-7                  ENGINE 5.7 LITREV 8
DRIVER   BP                TEST WT.  1814 KG.     GVW    0 KG
WET BULB TEMP  12 C        DRY BULB TEMP  26 C    REL. HUM.  13.8 PCT
SPEC. HUM.   2.9 GRAM/KG   BARO.  741.9 MM  HG.   MEASURED FUEL  0.00 KG

  RUN DURATION          23.29 MINUTES
  BLOWER INLET PRESS. 762.0  MM. H2O
  BLOWER DIF.  PRESS. 762.0  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    31169
  BLOWER REVOLUTIONS   112286
  BLOWER CU. CM /REV.  2228

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE          22.4/2
   HC  SAMPLE  PPM                            22
   HC  BACKGRD METER READING/SCALE           8.4/2
   HC  BACKGRD PPM                             8
   CO  SAMPLE  METER READING/SCALE          51.6/*
   CO  SAMPLE  PPM                            49
   CO  BACKGRD METER READING/SCALE            .1/*
   CO  BACKGRD PPM                             0
   CO2 SAMPLE  METER READING/SCALE          41.6/2
   CO2 SAMPLE  PERCENT                      1.82
   CO2 BACKGRD METER READING/SCALE           1.8/2
   CO2 BACKGRD PERCENT                       .07
   NOX SAMPLE  METER READING/SCALE          36.1/2
   NOX SAMPLE  PPM                          36.1
   NOX BACKGRD METER READING/SCALE            .5/2
   NOX BACKGRD PPM                            .5
   HC  CONCENTRATION PPM                      15
   CO  CONCENTRATION PPM                      47
   CO2 CONCENTRATION PCT                    1.77
   NOX CONCENTRATION PPM                    35.7
   SO2 COCENTRATION PPM                     0.0
   HC  MASS (GRAMS)                         1.82
   CO  MASS (GRAMS)                        11.47
   CO2 MASS (GRAMS)                      6782.82
   NOX MASS (GRAMS)                        11.31
   SO2 MASS (GRAMS)                         0.00

HC  GRAMS/KILOMETRE      .08
CO  GRAMS/KILOMETRE      .53
CO2 GRAMS/KILOMETRE   312
NOX GRAMS/KILOMETRE      .52
SO2 GRAMS/KILOMETRE     0.00

HC  GRAMS/KG OF FUEL    .85     HC  GRAMS/MIN    .08
CO  GRAMS/KG OF FUEL    5.3     CO  GRAMS/MIN     .5
CO2 GRAMS/KG OF FUEL   3158     CO2 GRAMS/MIN    291
NOX GRAMS/KG OF FUEL   5.27     NOX GRAMS/MIN    .49
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   13.38 LITRES PER HUNDRED KILOMETERS
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                           VEHICLE NUMBER EM9

DATE  3/29/78               TIME    -0 HRS.        TEST NO.  2
MODEL  1975 CHEVY NOVA      SET-7                  ENGINE 5.7 LITRED
RUN DURATION   23.29 MIN.   DISTANCE DRIVEN  21.79 KILOMETRES
CVS BLOWER TEST VOL.  250.19 ACT. CU. METRES

                                SAMPLE                 BACKGROUND
SULFATE DATA                    ------                 ----------

 FILTER NO.                   97FH-2899
 SAMPLE VOL. CU. FT.            16.30                      1.00
 SAMPLE TEMP. DEG. F               80                        70
 SAMPLE AREA SQ. IN.         12562.00                      0.00
 DILUTION FACTOR                    1                         1
 STAND. DEN. MICROG/ML           5.00                      1.00
 STAND. AREA SQ. IN.        137967.00                      1.00
 SO4,MICROG/FILTER              9.569                     0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.             1.00                      1.00
 SAMPLE TEMP. DEG. F               70                        70
 AREA,BUBBLER 1                  0.00                      0.00
 DIL. FACT.,BUBBLER 1               1                         1
 AREA,BUBBLER 2                  0.00                      0.00
 DIL. FACT.,BUBBLER 2               1                         1
 STAND. DEN. MICROG/ML           1.00                      1.00
 STAND. AREA,SQ. IN.             1.00                      1.00
 SO2, MILLIG/BUBBLER 1          0.000                     0.000
 SO2, MILLIG/BUBBLER 2          0.000                     0.000
 SO2, PPM                         0.0                       0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST              2.832
 NET H2SO4,MILLIGRAM/TEST                2.891
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE          .130
 NET H2SO4,MILLIGRAM/KILOMETRE            .133
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2198 GRAMS      SULFUR IN FUEL, .0310 PCT.
                             FUEL     SO2       H2SO4      SO2 + H2SO4
                             ----    -----    -------      -----------
            SULFUR,GRAMS      .67    0.000      .0009            .0009
            PCT. RECOVERY             0.00        .14              .14
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TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                       VEHICLE NUMBER EM9

DATE  3/29/78              TIME    -0 HRS.        TEST NO.  3
MODEL  1975 CHEVY NOVA     FET                    ENGINE 5.7 LITREV 8
DRIVER   BP                TEST WT.  1814 KG.     GVW    0 KG
WET BULB TEMP  17 C        DRY BULB TEMP  26 C    REL. HUM.  40.6 PCT
SPEC. HUM.   8.7 GRAM/KG   BARO.  741.9 MM  HG.   MEASURED FUEL  0.00 KG

  RUN DURATION          12.75 MINUTES
  BLOWER INLET PRESS. 762.0  MM. H2O
  BLOWER DIF.  PRESS. 762.0  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    23541
  BLOWER REVOLUTIONS    61454
  BLOWER CU. CM /REV.  2228

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE           26.0/2
   HC  SAMPLE  PPM                           26.0
   HC  BACKGRD METER READING/SCALE            9.6/2
   HC  BACKGRD PPM                           10
   CO  SAMPLE  METER READING/SCALE           47.3/*
   CO  SAMPLE  PPM                           45
   CO  BACKGRD METER READING/SCALE             .6/*
   CO  BACKGRD PPM                            1
   CO2 SAMPLE  METER READING/SCALE           50.3/2
   CO2 SAMPLE  PERCENT                       2.30
   CO2 BACKGRD METER READING/SCALE            1.5/2
   CO2 BACKGRD PERCENT                        .05
   NOX SAMPLE  METER READING/SCALE           52.4/2
   NOX SAMPLE  PPM                           52.4
   NOX BACKGRD METER READING/SCALE            1.1/2
   NOX BACKGRD PPM                            1.1
   HC  CONCENTRATION PPM                     16
   CO  CONCENTRATION PPM                      42
   CO2 CONCENTRATION PCT                     2.25
   NOX CONCENTRATION PPM                     51.5
   SO2 COCENTRATION PPM                      0.0
   HC  MASS (GRAMS)                         1.0546
   CO  MASS (GRAMS)                          5.58
   CO2 MASS (GRAMS)                        4736.24
   NOX MASS (GRAMS)                         10.56
   SO2 MASS (GRAMS)                          0.00

HC  GRAMS/KILOMETRE     0.06 (0.10)
CO  GRAMS/KILOMETRE       .34
CO2 GRAMS/KILOMETRE   287
NOX GRAMS/KILOMETRE       .64
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL  10.97     HC  GRAMS/MIN   1.30
CO  GRAMS/KG OF FUEL    3.7     CO  GRAMS/MIN     .4
CO2 GRAMS/KG OF FUEL   3129     CO2 GRAMS/MIN    371
NOX GRAMS/KG OF FUEL   6.98     NOX GRAMS/MIN    .83
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   12.44 LITRES PER HUNDRED KILOMETERS
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                   TABLE                     VEHICLE EMISSION RESULTS
                                          1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.    9        TEST NO. 1          DATE  3/31/78                  MFGR. CODE   -0              YR.  1975
VEHICLE MODEL  CHEVY NOVA                ENGINE   5.74 LITRE 8          CURB WT.      0 KG           GVW     0 KG

BAROMETER 744.98 MM OF HG.                                         WET BULB TEMP  16.7 DEG. C
DRY BULB TEMP.    21.7 DEG. C                                       ABS. HUMIDITY   9.9 GRAMS/KG
REL. HUMIDITY      60 PCT.

EXHAUST EMISSIONS
                                                                   BLOWER INLET PRESS., G1 736.6 MM. H2O
   BLOWER DIF. PRESS., G2, 736.6 MM. H2O                           BLOWER INLET TEMP.    43 DEG. C
   BAG RESULTS
   BAG NO.                                      1            2            3
   BLOWER REVOLUTIONS                         40695        69510        40540
   HC   SAMPLE  METER READING/SCALE            91.4/2       27.2/2       37.1/2
   HC   SAMPLE  PPM                            91           27           37
   HC   BACKGRD METER READING/SCALE           16.2/2       13.4/2       13.5/2
   HC   BACKGRD PPM                            16           13           13
   CO   SAMPLE  METER READING/SCALE           70.5/*       93.3/*       42.0/*
   CO   SAMPLE  PPM                           302           95           40
   CO   BACKGRD METER READING/SCALE            1.2/*        3.1/*        1.9/*
   CO   BACKGRD PPM                             4            3            2
   CO2  SAMPLE  METER READING/SCALE           43.4/2       66.7/3       87.0/3
   CO2  SAMPLE  PERCENT                       1.92         1.20         1.62
   CO2  BACKGRD METER READING/SCALE            2.1/2        3.7/3        4.0/3
   CO2  BACKGRD PERCENT                        .08          .06          .06
   NOX  SAMPLE  METER READING/SCALE           35.2/2       10.0/2       24.8/2
   NOX  SAMPLE  PPM                           35.2         10.0         24.8
   NOX  BACKGRD METER READING/SCALE             .8/2         .7/2         .6/2
   NOX  BACKGRD PPM                             .8           .7           .6
   SO2  SAMPLE  METER READING/SCALE          -0.0/*       -0.0/*       -0.0/*
   SO2  SAMPLE  PPM                           0.0          0.0          0.0
   SO2  BACKGRD METER READING/SCALE          -0.0/*       -0.0/*       -0.0/*
   SO2  BACKGRD PPM                           0.0          0.0          0.0

   HC   CONCENTRATION PPM                      78           15           25
   CO   CONCENTRATION PPM                     282           88           36
   CO2  CONCENTRATION PCT                     1.85         1.15         1.56
   NOX  CONCENTRATION PPM                     34.5          9.4         24.3
   SO2  CONCENTRATION PPM                     0.0          0.0          0.0
   HC   MASS GRAMS                            3.42         1.13         1.11
   CO   MASS GRAMS                           25.04        13.34         3.20
   CO2  MASS GRAMS                         2603.17      2747.23      2183.93
   NOX  MASS GRAMS                            4.91         2.28         3.44
   SO2  MASS GRAMS                            0.00         0.00         0.00

   WEIGHTED MASS HC        .27 GRAMS/KILOMETRE
   WEIGHTED MASS CO       2.15 GRAMS/KILOMETRE
   WEIGHTED MASS CO2    423.57 GRAMS/KILOMETRE
   WEIGHTED MASS NOX       .53 GRAMS/KILOMETRE
   WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

   FUEL ECONOMY BY CARBON BALANCE =   5.5  KILOMETRE/LITRE
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER EM9

DATE  3/31/78                TIME     -0 HRS.          TEST NO.  2
MODEL  1975 CHEVY NOVA       SET-7                     ENGINE 5.7 LITREV 8
DRIVER   SR                  TEST WT.  1814 KG.        GVW    0 KG
WET BULB TEMP  18 C          DRY BULB TEMP  25 C       REL. HUM.  49.0 PCT
SPEC. HUM.    9.9 GRAM/KG    BARO.  745.0 MM  HG.      MEASURED FUEL  0.00 KG

  RUN DURATION          23.29 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H20
  BLOWER DIF.  PRESS. 736.6  MM  H20
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS     37379
  BLOWER REVOLUTIONS   112422
  BLOWER CU. CM /REV.  2229

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE               30.0/2
   HC   SAMPLE  PPM                                30
   HC   BACKGRD METER READING/SCALE               16.9/2
   HC   BACKGRD PPM                                17
   CO   SAMPLE  METER READING/SCALE               39.2/*
   CO   SAMPLE  PPM                                37
   CO   BACKGRD METER READING/SCALE                4.7/*
   CO   BACKGRD PPM                                 5
   CO2 SAMPLE   METER READING/SCALE               42.4/2
   CO2 SAMPLE   PERCENT                           1.87
   CO2 BACKGRD METER READING/SCALE                 2.2/2
   CO2 BACKGRD PERCENT                             .08
   NOX SAMPLE   METER READING/SCALE               37.0/2
   NOX SAMPLE   PPM                               37.0
   NOX HACKGRD METER READING/SCALE                 1.1/2
   NOX BACKGRD PPM                                 1.1
   HC   CONCENTRATION PPM                          15
   CO   CONCENTRATION PPM                          31
   CO2 CONCENTRATION PCT                          1.80
   NOX CONCENTRATION PPM                          36.1
   SO2 COCENTRATION PPM                           0.0
   HC   MASS (GRAMS)                              1.88
   CO   MASS (GRAMS)                              7.69
   CO2 MASS (GRAMS)                            6970.39
   NOX MASS (GRAMS)                              14.15
   SO2 MASS (GRAMS)                               0.00

HC   GRAMS/KILOMETRE       .09
CO   GRAMS/KILOMETRE       .35
CO2 GRAMS/KILOMETRE    321
NOX GRAMS/KILOMETRE       .65
SO2 GRAMS/KILOMETRE      0.00

HC   GRAMS/KG OF FUEL     .85     HC   GRAMS/MIN     .08
CO   GRAMS/KG OF FUEL    3.5      CO   GRAMS/MIN      .3
CO2 GRAMS/KG OF FUEL   3161      CO2 GRAMS/MIN    299
NOX GRAMS/KG OF FUEL   6.42      NOX GRAMS/MIN     .61
SO2 GRAMS/KG OF FUEL   0.00      SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =   13.74 LITRES PER HUNDRED KILOMETERS
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER EM9

DATE  3/31/78                TIME    -0 HRS.          TEST NO.  2
MODEL  1975 CHEVY NOVA       SET-7                    ENGINE 5.7 LITREO
RUN DURATION   23.29 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  250.53 ACT. CU. METRES

                             SAMPLE                   BACKGROUND
SULFATE DATA                 ------                   ----------

 FILTER NO.                47FH-2902
 SAMPLE VOL. CU. FT.          15.79                         1.00
 SAMPLE TEMP. DEG. F          80                            70
 SAMPLE AREA SQ. IN.       66447.00                         0.00
 DILUTION FACTOR              1                             1
 STAND. DEN. MICROG/ML        5.00                          1.00
 STAND. AREA SQ. IN.     146019.00                          1.00
 SO4,MICROG/FILTER           22.753                         0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                          1.00
 SAMPLE TEMP. DEG. F          70                            70
 AREA,BUBBLER 1               0.00                          0.00
 DIL. FACT.,BUBBLER 1         1                             1
 AREA,BUBBLER 2               0.00                          0.00
 DIL. FACT.,BUBBLER 2         1                             1
 STAND. DEN. MICROG/ML        1.00                          1.00
 STAND. AREA,SQ. IN.          1.00                          1.00
 SO2, MILLIG/BUBBLER 1        0.000                         0.000
 SO2, MILLIG/BUBBLER 2        0.000                         0.000
 SO2, PPM                     0.0                           0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST           14.512
 NET H2SO4,MILLIGRAM/TEST             14.816
 NET SO2,GRAM/TEST                     0.000
 NET SULFATE,MILLIGRAM/KILOMETRE        .668
 NET H2SO4,MILLIGRAM/KILOMETRE          .682
 NET SO2,GRAM/KILOMETRE                0.000

SULFUR BALANCE
 FUEL WT., 2205 GRAMS      SULFUR IN FUEL, .0310 PCT.
                             FUEL      SO2       H2SO4       SO2 + H2SO4
                             ----     -----     -------     -----------
           SULFUR,GRAMS       .68     0.000      .0048          .0048
           PCT. RECOVERY              0.00        .71            .71
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        TABLE         EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                                VEHICLE NUMBER EM9

DATE  3/31/78               TIME     -0 HRS.          TEST NO.  3
MODEL  1977 CHEVY NOVA      FET                       ENGINE 5.7 LITREV 8
DRIVER   SR                 TEST WT.  1814 KG.        GVW    0 KG
WET BULB TEMP  18 C         DRY BULB TEMP  24 C       REL. HUM.  55.4 PCT
SPEC. HUM. .10.8 GRAM/KG    BARO.  745.0 MM  HG.      MEASURED FUEL  0.00 KG

  RUN DURATION          12.76 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H2O
  BLOWER DIF.  PRESS. 736.6  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    23847
  BLOWER REVOLUTIONS    61513
  BLOWER CU. CM /REV.  2228

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE              31.1/2
   HC   SAMPLE  PPM                                31
   HC   BACKGRD METER READING/SCALE              15.2/2
   HC   BACKGRD PPM                                15
   CO   SAMPLE  METER READING/SCALE              67.6/*
   CO   SAMPLE  PPM                                66
   CO   BACKGRD METER READING/SCALE              14.4/*
   CO   BACKGRD PPM                                14
   CO2  SAMPLE  METER READING/SCALE              50.2/2
   CO2  SAMPLE  PERCENT                          2.29
   CO2  BACKGRD METER READING/SCALE               2.1/2
   CO2  BACKGRD PERCENT                           .08
   NOX  SAMPLE  METER READING/SCALE              57.8/2
   NOX  SAMPLE  PPM                              57.8
   NOX  BACKGRD METER READING/SCALE               1.7/2
   NOX  BACKGRD PPM                               1.7
   HC   CONCENTRATION PPM                          19
   CO   CONCENTRATION PPM                          50
   CO2  CONCENTRATION PCT                        2.23
   NOX  CONCENTRATION PPM                        56.4
   SO2  COCENTRATION PPM                          0.0
   HC   MASS (GRAMS)                             1.23
   CO   MASS (GRAMS)                             6.78
   CO2  MASS (GRAMS)                          4733.97
   NOX  MASS (GRAMS)                            12.48
   SO2  MASS (GRAMS)                             0.00

 HC   GRAMS/KILOMETRE       .07
 CO   GRAMS/KILOMETRE       .41
 CO2  GRAMS/KILOMETRE   287
 NOX  GRAMS/KILOMETRE       .76
 SO2  GRAMS/KILOMETRE      0.00

 HC   GRAMS/KG OF FUEL     .82     HC   GRAMS/MIN     .10
 CO   GRAMS/KG OF FUEL     4.5     CO   GRAMS/MIN      .5
 CO2  GRAMS/KG OF FUEL    3160     CO2  GRAMS/MIN     371
 NOX  GRAMS/KG OF FUEL    8.33     NOX  GRAMS/MIN     .98
 SO2  GRAMS/KG OF FUEL    0.00     SO2  GRAMS/MIN    0.00
 CARBON BALANCE FUEL ECONUMY =   12.32 LITRES PER HUNDRED KILOMETERS
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                               TABLE                  VEHICLE EMISSION RESULTS
                                                   1978  LIGHT DUTY EMISSIONS TEST
                                             ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM9      TEST NO.      1       DATE  4/25/78                     MFGR. CODE    -0                 YR.  1975
VEHICLE MODEL  CHEVROLET NOVA            ENGINE   5.74 LITRE 8             CURB WT.     0 KG                GVM     0 KG

BAROMETER 744.73 MM OF HG.                                            WET BULB TEMP  14.4 DEG. C
DRY BULB TEMP.   21.7 DEG. C                                           ABS. HUMIDITY   7.4 GRAMS/KG
REL. HUMIDITY     45 PCT.                                              COMMENTS  1978 FTPC

EXHAUST EMISSIONS
                                                                      BLOWER INLET PRESS., G1 736.6 MM. H2O
     BLOWER DIF. PRESS., G2, 736.6 MM. H2O                            BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                        1                2                3
     BLOWER REVOLUTIONS                         40708            69485            40543
     HC   SAMPLE  METER READING/SCALE            94.7/ 2          31.2/ 2          45.0/ 2
     HC   SAMPLE  PPM                            95               31               45
     HC   BACKGRD METER READING/SCALE             9.2/ 2           8.8/ 2           8.3/ 2
     HC   BACKGRD PPM                             9                9                8
     CO   SAMPLE  METER READING/SCALE            81.8/11          59.5/11          73.8/12
     CO   SAMPLE  PPM                            379              237              168
     CO   BACKGRD METER READING/SCALE              .6/11            .1/11            .4/12
     CO   BACKGRD PPM                               2                0                1
     CO2  SAMPLE  METER READING/SCALE            96.6/ 3          63.3/ 3          84.6/ 3
     CO2  SAMPLE  PERCENT                        1.82             1.13             1.57
     CO2  BACKGRD METER READING/SCALE             3.0/ 3           3.1/ 3           3.0/ 3
     CO2  BACKGRD PERCENT                          .05              .05              .05
     NOX  SAMPLE  METER READING/SCALE            44.9/ 2          10.8/ 2          32.6/ 2
     NOX  SAMPLE  PPM                            44.9             10.8             32.6
     NOX  BACKGRD METER READING/SCALE              .9/ 2            .7/ 2            .8/ 2
     NOX  BACKGRD PPM                              .9               .7               .8
     SO2  SAMPLE  METER READING/SCALE            -0.0/-0          -0.0/-0          -0.0/-0
     SO2  SAMPLE  PPM                            -0.0             -0.0             -0.0
     SO2  BACKGRD METER READING/SCALE            -0.0/-0          -0.0/-0          -0.0/-0
     SO2  BACKGRD PPM                            -0.0             -0.0             -0.0

     HC   CONCENTRATION PPM                         87               23               38
     CO   CONCENTRATION PPM                        359              229              160
     CO2  CONCENTRATION PCT                       1.78             1.09             1.52
     NOX  CONCENTRATION PPM                       44.1             10.2             31.9
     SO2  CONCENTRATION PPM                        0.0              0.0              0.0
     HC   MASS GRAMS                              3.82             1.74             1.65
     CO   MASS GRAMS                             31.92            34.68            14.16
     CO2  MASS GRAMS                           2484.47          2590.02          2123.02
     NOX  MASS GRAMS                              5.80             2.28             4.18
     SO2  MASS GRAMS                              0.00             0.00             0.00
     HC GRAMS/KM (GRAMS/MILE)                      .67 (  1.07)      .28 (   .46)      .29 (   .46)
     CO GRAMS/KM (GRAMS/MILE)                     5.56 (  8.94)     5.64 (  9.07)     2.46 (  3.96)
     CO2 GRAMS/KM (GRAMS/MILE)                  432.65 (696.14)   421.03 (677.44)   368.88 (593.53)
     NOX GRAMS/KM (GRAMS/MILE)                    1.01 (  1.63)      .37 (   .60)      .73 (  1.17)
     FUEL CONSUMPTION BY CB  L/100KM (MPG)       18.93 ( 12.43)    18.39 ( 12.79)    15.95 ( 14.75)
     CVS FLOW STD. CU. METRES (SCF)               76.4 (2696.5)    130.3 (4602.0)     76.0 (2685.2)
     CALCULATED DISTANCE KM(MILES)                5.74 (  3.57)     6.15 (  3.82)     5.76 (  3.58)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)          17.83 ( 13.20)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                   .36 (   .58)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                  4.75 (  7.64)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)               409.08 (658.21)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)                  .60 (   .97)
    TOTAL CVS FLOW =   282.7 STD. CU. METRES
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER EM9

  DATE  4/25/78                TIME    -0 HRS.        TEST NO.  2
  MODEL  1975 CHEVROLET NOVA SET-7                   ENGINE 5.7 LITRE  8
  DRIVER   JC                  TEST WT.  1814 KG.     GVW    0 KG
  WET BULB TEMP  14 C          DRY BULB TEMP  25 C    REL. HUM.  29.7 PCT
  SPEC. HUM.   5.9 GRAM/KG     BARO.  745.0 MM  HG.   MEASURED FUEL  0.00 KG
  DISTANCE  21.805 KM            FUEL 738.2 G/LITRE   FUEL HC  RATIO 1.860

   RUN DURATION           23.30 MINUTES
   BLOWER INLET PRESS.    762.0  MM. H2O
   BLOWER DIF.  PRESS.    762.0  MM  H2O
   BLOWER INLET TEMP.       43  DEG. C
   DYNO REVOLUTIONS     31689
   BLOWER REVOLUTIONS   112237
   BLOWER CU. CM /REV.  2228

   BAG RESULTS
    HC   SAMPLE  METER READING/SCALE           29.5/ 2
    HC   SAMPLE  PPM                             29
    HC   BACKGRD METER READING/SCALE           10.5/ 2
    HC   BACKGRD PPM                             10
    CO   SAMPLE  METER READING/SCALE           49.1/12
    CO   SAMPLE  PPM                            108
    CO   BACKGRD METER READING/SCALE             .2/12
    CO   BACKGRD PPM                              0
    CO2  SAMPLE  METER READING/SCALE           93.2/ 3
    CO2  SAMPLE  PERCENT                       1.75
    CO2  BACKGRD METER READING/SCALE            3.1/ 3
    CO2  BACKGRD PERCENT                        .05
    NOX  SAMPLE  METER READING/SCALE           42.7/ 2
    NOX  SAMPLE  PPM                           42.7
    NOX  BACKGRD METER READING/SCALE             .7/ 2
    NOX  BACKGRD PPM                             .7
    HC   CONCENTRATION PPM                       20
    CO   CONCENTRATION PPM                      103
    CO2  CONCENTRATION PCT                     1.70
    NOX  CONCENTRATION PPM                     42.1
    SO2  COCENTRATION PPM                       0.0
    HC   MASS (GRAMS)                          2.46
    CO   MASS (GRAMS)                         25.17
    CO2  MASS (GRAMS)                       6540.41
    NOX  MASS (GRAMS)                         14.58
    SO2  MASS (GRAMS)                          0.00

  HC   GRAMS/KM (GRAMS/MILE)        .11 (   .18)
  CO   GRAMS/KM (GRAMS/MILE)       1.15 (  1.86)
  CO2  GRAMS/KM (GRAMS/MILE)        300 (   483)
  NOX  GRAMS/KM (GRAMS/MILE)        .67 (  1.08)
  SO2  GRAMS/KM (GRAMS/MILE)       0.00 (  0.00)

  HC   GRAMS/KG OF FUEL   1.19     HC   GRAMS/MIN    .11
  CO   GRAMS/KG OF FUEL   12.1     CO   GRAMS/MIN    1.1
  CO2  GRAMS/KG OF FUEL   3147     CO2  GRAMS/MIN    281
  NOX  GRAMS/KG OF FUEL   7.02     NOX  GRAMS/MIN    .63
  SO2  GRAMS/KG OF FUEL   0.00     SO2  GRAMS/MIN   0.00

  CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      12.89 ( 18.24)

   TOTAL CVS FLOW=   209.7STD. CU. METRES
 ERROR  [01709        042578    FORD PINTO     FET             78 9.7   I4   9.7 2750     ] END OF RECORD
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER EM9

DATE  4/25/78               TIME    -0 HRS.        TEST NO.  2
MODEL  1975 CHEVROLET NOVA SET-7                   ENGINE 5.7 LITREO
RUN DURATION   23.30 MIN.  DISTANCE DRIVEN  21.77 KILOMETRES
CVS BLOWER TEST VOL.  250.05 ACT. CU. METRES

                              SAMPLE                BACKGROUND
SULFATE DATA                  ------                ----------

 FILTER NO.                 47 FH-2922
 SAMPLE VOL. CU. FT.          17.65                    1.00
 SAMPLE TEMP. DEG. F             81                      70
 SAMPLE AREA SQ. IN.       54421.00                    0.00
 DILUTION FACTOR                  1                       1
 STAND. DEN. MICROG/ML         5.00                    1.00
 STAND. AREA SQ. IN.      155115.00                    1.00
 SO4,MICROG/FILTER           17.542                   0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.           1.00                    1.00
 SAMPLE TEMP. DEG. F             70                      70
 AREA,BUBBLER 1                0.00                    0.00
 DIL. FACT.,BUBBLER 1             1                       1
 AREA,BUBBLER 2                0.00                    0.00
 DIL. FACT.,BUBBLER 2             1                       1
 STAND. DEN. MICROG/ML         1.00                    1.00
 STAND. AREA,SQ. IN.           1.00                    1.00
 SO2, MILLIG/BUBBLER 1        0.000                   0.000
 SO2, MILLIG/BUBBLER 2        0.000                   0.000
 SO2, PPM                       0.0                     0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST            10.015
 NET H2SO4,MILLIGRAM/TEST              10.226
 NET SO2,GRAM/TEST                      0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         .460
 NET H2SO4,MILLIGRAM/KILOMETRE           .470
 NET SO2,GRAM/KILOMETRE                 0.000

SULFUR BALANCE
 FUEL WT., 2087 GRAMS      SULFUR IN FUEL, .0310 PCT.
                              FUEL     SO2      H2SO4      SO2 + H2SO4
                              ----    -----    -------    -----------
          SULFUR,GRAMS         .65    0.000      .0033          .0033
          PCT. RECOVERY               0.00        .52            .52
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        TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                               VEHICLE NUMBER EM9

DATE  4/25/78                 TIME    -0 HRS.         TEST NO.  3
MODEL  1975 CHEVROLET NOVA FET  EM-9                  ENGINE 5.7 LITRE  8
DRIVER   JC                   TEST WT.  1814 KG.      GVW    0 KG
WET BULB TEMP  16 C           DRY BULB TEMP  27 C     REL. HUM.  27.4 PCT
SPEC. HUM.   6.2 GRAM/KG      BARO.  745.0 MM  HG.    MEASURED FUEL  0.00 KG
DISTANCE  16.621 KM             FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

  RUN DURATION          12.76 MINUTES
  BLOWER INLET PRESS.    769.6  MM. H2O
  BLOWER DIF.  PRESS.    769.6  MM  H2O
  BLOWER INLET TEMP.       44  DEG. C
  DYNO REVOLUTIONS     24155
  BLOWER REVOLUTIONS     61575
  BLOWER CU. CM /REV.  2229

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE           30.4/ 2
   HC  SAMPLE  PPM                             30
   HC  BACKGRD METER READING/SCALE           12.7/ 2
   HC  BACKGRD PPM                             13
   CO  SAMPLE  METER READING/SCALE           16.1/13
   CO  SAMPLE  PPM                             15
   CO  BACKGRD METER READING/SCALE            1.3/13
   CO  BACKGRD PPM                              1
   CO2 SAMPLE  METER READING/SCALE           47.6/ 2
   CO2 SAMPLE  PERCENT                       2.15
   CO2 BACKGRD METER READING/SCALE            1.5/ 2
   CO2 BACKGRD PERCENT                        .05
   NOX SAMPLE  METER READING/SCALE           58.5/ 2
   NOX SAMPLE  PPM                           58.5
   NOX BACKGRD METER READING/SCALE             .8/ 2
   NOX BACKGRD PPM                             .8
   HC  CONCENTRATION PPM                       20
   CO  CONCENTRATION PPM                       14
   CO2 CONCENTRATION PCT                     2.10
   NOX CONCENTRATION PPM                     57.8
   SO2 COCENTRATION PPM                      0.0
   HC  MASS (GRAMS)                          1.31
   CO  MASS (GRAMS)                          1.81
   CO2 MASS (GRAMS)                       4417.71
   NOX MASS (GRAMS)                         11.06
   SO2 MASS (GRAMS)                          0.00

HC  GRAMS/KM (GRAMS/MILE)         .08 (   .13)
CO  GRAMS/KM (GRAMS/MILE)         .11 (   .18)
CO2 GRAMS/KM (GRAMS/MILE)         266 (   428)
NOX GRAMS/KM (GRAMS/MILE)         .67 (  1.07)
SO2 GRAMS/KM (GRAMS/MILE)        0.00 (  0.00)

HC  GRAMS/KG OF FUEL     .94      HC  GRAMS/MIN     .10
CO  GRAMS/KG OF FUEL     1.3      CO  GRAMS/MIN      .1
CO2 GRAMS/KG OF FUEL    3164      CO2 GRAMS/MIN     346
NOX GRAMS/KG OF FUEL    7.93      NOX GRAMS/MIN     .87
SO2 GRAMS/KG OF FUEL    0.00      SO2 GRAMS/MIN    0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      11.36 ( 20.70)

TOTAL CVS FLOW=   114.8STD. CU. METRES
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                                TABLE                    VEHICLE EMISSION RESULTS
                                                     1978  LIGHT DUTY EMISSIONS TEST
                                                 ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM9      TEST NO.      1        DATE  4/26/78
VEHICLE MODEL  CHEVROLET NOVA             ENGINE   5.74 LITRE 8        MFGR. CODE   -0          YR.  1975
                                                                       CURB WT.     0 KG        GVM     0 KG
BAROMETER 744.98 MM OF HG.
DRY BULB TEMP.   21.1 DEG. C                                      WET BULB TEMP  12.8 DEG. C
REL. HUMIDITY     37 PCT.                                          ABS. HUMIDITY   5.8 GRAMS/KG
                                                                   COMMENTS  1978 FTPC
EXHAUST EMISSIONS

    BLOWER DIF. PRESS., G2, 762.0 MM. H2O                         BLOWER INLET PRESS., G1 762.0 MM. H2O
    BAG RESULTS                                                   BLOWER INLET TEMP.   43 DEG. C
    BAG NO.                                    1              2              3
    BLOWER REVOLUTIONS                     40656          69632          40587
    HC   SAMPLE  METER READING/SCALE        94.6/ 2        24.9/ 2        40.9/ 2
    HC   SAMPLE  PPM                        95             25             41
    HC   BACKGRD METER READING/SCALE        10.5/ 2        10.5/ 2        10.7/ 2
    HC   BACKGRD PPM                        10             10             11
    CO   SAMPLE  METER READING/SCALE        91.1/12        20.5/13        22.8/13
    CO   SAMPLE  PPM                       220             20             22
    CO   BACKGRD METER READING/SCALE         8.7/12        15.9/13        11.1/13
    CO   BACKGRD PPM                        16             15             11
    CO2  SAMPLE  METER READING/SCALE        96.9/ 3        63.0/ 3        83.5/ 3
    CO2  SAMPLE  PERCENT                    1.82           1.12           1.54
    CO2  BACKGRD METER READING/SCALE         3.6/ 3         3.7/ 3         3.6/ 3
    CO2  BACKGRD PERCENT                     .06            .06            .06
    NOX  SAMPLE  METER READING/SCALE        49.4/ 2        12.7/ 2        32.7/ 2
    NOX  SAMPLE  PPM                        49.4           12.7           32.7
    NOX  BACKGRD METER READING/SCALE          .9/ 2          .7/ 2          .7/ 2
    NOX  BACKGRD PPM                          .9             .7             .7
    SO2  SAMPLE  METER READING/SCALE        -0.0/-0        -0.0/-0        -0.0/-0
    SO2  SAMPLE  PPM                        -0.0           -0.0           -0.0
    SO2  BACKGRD METER READING/SCALE        -0.0/-0        -0.0/-0        -0.0/-0
    SO2  BACKGRD PPM                        -0.0           -0.0           -0.0

    HC   CONCENTRATION PPM                  86             15             31
    CO   CONCENTRATION PPM                 196              5             11
    CO2  CONCENTRATION PCT                  1.78           1.07           1.49
    NOX  CONCENTRATION PPM                  48.6           12.1           32.1
    SO2  CONCENTRATION PPM                   0.0            0.0            0.0
    HC   MASS GRAMS                          3.75           1.15           1.37
    CO   MASS GRAMS                         17.31            .77           1.01
    CO2  MASS GRAMS                       2468.87        2549.62        2072.95
    NOX  MASS GRAMS                          6.08           2.58           4.01
    SO2  MASS GRAMS                          0.00           0.00           0.00
    HC GRAMS/KM (GRAMS/MILE)                  .65 (  1.04)    .19 (   .30)    .24 (   .38)
    CO GRAMS/KM (GRAMS/MILE)                 2.99 (  4.81)    .13 (   .20)    .17 (   .28)
    CO2 GRAMS/KM (GRAMS/MILE)              426.78 (686.69) 413.63 (665.53) 359.20 (577.95)
    NOX GRAMS/KM (GRAMS/MILE)                1.05 (  1.69)    .42 (   .67)    .69 (  1.12)
    FUEL CONSUMPTION BY CB  L/100KM (MPG)   18.50 ( 12.71)  17.69 ( 13.30)  15.37 ( 15.30)
    CVS FLOW STD. CU. METRES (SCF)           75.9 (2681.6)  130.0 (4592.0)   75.8 (2676.8)
    CALCULATED DISTANCE KM(MILES)            5.78 (  3.60)   6.16 (  3.83)   5.77 (  3.59)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)        17.22 ( 13.66)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                .30 (   .48)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                .74 (  1.18)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)            401.37 (645.80)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)               .63 (  1.01)
    TOTAL CVS FLOW =   281.8 STD. CU. METRES
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     TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER EM4

  DATE  4/26/78                TIME    -0 HRS.          TEST NO.  2
  MODEL  1975 CHEVROLET NOVA SET-7                      ENGINE 5.7 LITRE  8
  DRIVER   TJ                  TEST WT.  1814 KG.       GVW    0 KG
  WET BULB TEMP  14 C          DRY BULB TEMP  24 C      REL. HUM.  34.3 PCT
  SPEC. HUM.   6.4 GRAM/KG     BARO.  745.0 MM  HG.     MEASURED FUEL  0.00 KG
  DISTANCE  21.721 KM            FUEL 738.2 G/LITRE     FUEL HC  RATIO 1.860

   RUN DURATION          23.29 MINUTES
   BLOWER INLET PRESS.    762.0  MM. H2O
   BLOWER DIF.  PRESS.    762.0  MM  H2O
   BLOWER INLET TEMP.       44  DEG. C
   DYNO REVOLUTIONS     31567
   BLOWER REVOLUTIONS    112159
   BLOWER CU. CM /REV.  2230

   BAG RESULTS
    HC   SAMPLE  METER READING/SCALE                33.9/ 2
    HC   SAMPLE  PPM                                  34
    HC   BACKGRD METER READING/SCALE                13.3/ 2
    HC   BACKGRD PPM                                  13
    CO   SAMPLE  METER READING/SCALE                12.6/13
    CO   SAMPLE  PPM                                  12
    CO   BACKGRD METER READING/SCALE                 8.7/13
    CO   BACKGRD PPM                                   8
    CO2 SAMPLE  METER READING/SCALE                 96.8/ 3
    CO2 SAMPLE  PERCENT                             1.82
    CO2 BACKGRD METER READING/SCALE                  4.6/ 3
    CO2 BACKGRD PERCENT                              .07
    NOX SAMPLE  METER READING/SCALE                 45.4/ 2
    NOX SAMPLE  PPM                                 45.4
    NOX BACKGRD METER READING/SCALE                   .5/ 2
    NOX BACKGRD PPM                                   .5
    HC   CONCENTRATION PPM                            22
    CO   CONCENTRATION PPM                             4
    CO2 CONCENTRATION PCT                           1.76
    NOX CONCENTRATION PPM                           45.0
    SO2 COCENTRATION PPM                            0.0
    HC   MASS (GRAMS)                               2.70
    CO   MASS (GRAMS)                               1.06
    CO2 MASS (GRAMS)                             6743.54
    NOX MASS (GRAMS)                               15.77
    SO2 MASS (GRAMS)                                0.00

  HC   GRAMS/KM (GRAMS/MILE)         .12 (   .20)
  CO   GRAMS/KM (GRAMS/MILE)         .05 (   .08)
  CO2 GRAMS/KM (GRAMS/MILE)          310 (   500)
  NOX GRAMS/KM (GRAMS/MILE)          .73 (  1.17)
  SO2 GRAMS/KM (GRAMS/MILE)         0.00 (  0.00)

  HC   GRAMS/KG OF FUEL    1.27     HC   GRAMS/MIN     .12
  CO   GRAMS/KG OF FUEL      .5     CO   GRAMS/MIN      .0
  CO2 GRAMS/KG OF FUEL     3165     CO2 GRAMS/MIN     290
  NOX GRAMS/KG OF FUEL     7.40     NOX GRAMS/MIN     .68
  SO2 GRAMS/KG OF FUEL     0.00     SO2 GRAMS/MIN    0.00

  CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)       13.27 ( 17.73)

  TOTAL CVS FLOW=   209.4STD. CU. METRES
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        TABLE         EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                                VEHICLE NUMBER EM9

DATE  4/26/78                  TIME    -0 HRS.         TEST NO.  2
MODEL  1975 CHEVROLET NOVA SET-7                       ENGINE 5.7 LITREO
RUN DURATION   23.29 MIN.  DISTANCE DRIVEN  21.77 KILOMETRES
CVS BLOWER TEST VOL.  250.07 ACT. CU. METRES

                                 SAMPLE                 BACKGROUND
SULFATE DATA                     ------                 ----------

 FILTER NO.                    47 FH-2925
 SAMPLE VOL. CU. FT.             17.23                    1.00
 SAMPLE TEMP. DEG. F              79                        70
 SAMPLE AREA SQ. IN.          59005.00                    0.00
 DILUTION FACTOR                    5                        1
 STAND. DEN. MICROG/ML          20.00                     1.00
 STAND. AREA SQ. IN.         155539.00                    1.00
 SO4,MICROG/FILTER             379.358                   0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.             1.00                     1.00
 SAMPLE TEMP. DEG. F               70                       70
 AREA,BUBBLER 1                  0.00                     0.00
 DIL. FACT.,BUBBLER 1               1                        1
 AREA,BUBBLER 2                  0.00                     0.00
 DIL. FACT.,BUBBLER 2               1                        1
 STAND. DEN. MICROG/ML           1.00                     1.00
 STAND. AREA,SQ. IN.             1.00                     1.00
 SO2, MILLIG/BUBBLER 1          0.000                    0.000
 SO2, MILLIG/BUBBLER 2          0.000                    0.000
 SO2, PPM                         0.0                      0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST              223.180
 NET H2SO4,MILLIGRAM/TEST                227.867
 NET SO2,GRAM/TEST                         0.000
 NET SULFATE,MILLIGRAM/KILOMETRE          10.252
 NET H2SO4,MILLIGRAM/KILOMETRE            10.467
 NET SO2,GRAM/KILOMETRE                    0.000

SULFUR BALANCE
 FUEL WT., 2190 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2        H2SO4       SO2 + H2SO4
                            ----     -----      -------     -----------
          SULFUR,GRAMS       .66     0.000        .0745          .0745
          PCT. RECOVERY               0.00        11.23          11.23
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     TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER EM9

                                      TIME     -0 HRS.        TEST NO.  3
DATE  4/26/78                                                 ENGINE 5.7 LITRE  8
MODEL  1975 CHEVROLET NOVA HFET                               GVW    0 KG
DRIVER   TJ                           TEST WT.  1814 KG.      REL. HUM.  34.3 PCT
WET BULB TEMP  14 C                   DRY BULB TEMP  24 C     MEASURED FUEL  0.00 KG
SPEC. HUM.   6.4 GRAM/KG              BARO.  745.0 MM  HG.    FUEL HC  RATIO 1.860
DISTANCE  16.386 KM                      FUEL 738.2 G/LITRE

  RUN DURATION            12.75 MINUTES
  BLOWER INLET PRESS.      762.0  MM. H20
  BLOWER DIF.  PRESS.      762.0  MM  H20
  BLOWER INLET TEMP.        43  DEG. C
  DYNO REVOLUTIONS      23814
  BLOWER REVOLUTIONS      61389
  BLOWER CU. CM /REV.   2228

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE               35.7/ 2
   HC   SAMPLE  PPM                                 36
   HC   BACKGRD METER READING/SCALE               12.1/ 2
   HC   BACKGRD PPM                                 12
   CO   SAMPLE  METER READING/SCALE                9.7/13
   CO   SAMPLE  PPM                                  9
   CO   BACKGRD METER READING/SCALE                5.3/13
   CO   BACKGRD PPM                                  5
   CO2  SAMPLE  METER READING/SCALE               47.4/ 2
   CO2  SAMPLE  PERCENT                           2.14
   CO2  BACKGRD METER READING/SCALE                1.7/ 2
   CO2  BACKGRD PERCENT                            .06
   NOX  SAMPLE  METER READING/SCALE               56.0/ 2
   NOX  SAMPLE  PPM                               56.0
   NOX  BACKGRD METER READING/SCALE                1.1/ 2
   NOX  BACKGRD PPM                                1.1
   HC   CONCENTRATION PPM                           26
   CO   CONCENTRATION PPM                            5
   CO2  CONCENTRATION PCT                         2.09
   NOX  CONCENTRATION PPM                         55.1
   SO2  COCENTRATION PPM                          0.0
   HC   MASS (GRAMS)                              1.69
   CO   MASS (GRAMS)                               .61
   CO2  MASS (GRAMS)                           4376.59
   NOX  MASS (GRAMS)                             10.58
   SO2  MASS (GRAMS)                              0.00

 HC   GRAMS/KM (GRAMS/MILE)          .10 (    .17)
 CO   GRAMS/KM (GRAMS/MILE)          .04 (    .06)
 CO2  GRAMS/KM (GRAMS/MILE)          267 (    430)
 NOX  GRAMS/KM (GRAMS/MILE)          .65 (  1.04)
 SO2  GRAMS/KM (GRAMS/MILE)         0.00 (  0.00)

 HC   GRAMS/KG OF FUEL   1.22     HC   GRAMS/MIN    .13
 CO   GRAMS/KG OF FUEL     .4     CO   GRAMS/MIN    .0
 CO2  GRAMS/KG OF FUEL   3165     CO2  GRAMS/MIN    343
 NOX  GRAMS/KG OF FUEL   7.65     NOX  GRAMS/MIN    .83
 SO2  GRAMS/KG OF FUEL   0.00     SO2  GRAMS/MIN   0.00

 CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      11.42 ( 20.61)

 TOTAL CVS FLOW=   114.7STD. CU. METRES
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                   TABLE                    VEHICLE EMISSION RESULTS
                                          1978  LIGHT DUTY EMISSIONS TEST
                                       ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.   26      TEST NO.     1      DATE  5/17/78                MFGR. CODE   -0              YR.  1975
VEHICLE MODEL  CHEVY NOVA              ENGINE   5.74 LITRE 8        CURB WT.     0 KG            GVM     0 K

BAROMETER 732.54 MM OF HG.                                          WET BULB TEMP  20.6 DEG. C
DRY BULB TEMP.   25.6 DEG. C                                         ABS. HUMIDITY  13.6 GRAMS/KG
REL. HUMIDITY     64 PCT.                                            COMMENTS  1978 FTPC

EXHAUST EMISSIONS                                                   BLOWER INLET PRESS., G1 762.0 MM. H2O
                                                                    BLOWER INLET TEMP.   43 DEG. C
    BLOWER DIF. PRESS., G2, 762.0 MM. H2O
    BAG RESULTS
    BAG NO.                                  1               2               3
    BLOWER REVOLUTIONS                     40617           69618           40551
    HC   SAMPLE  METER READING/SCALE        87.6/ 2         36.2/ 2         51.9/ 2
    HC   SAMPLE  PPM                        88              36              52
    HC   BACKGRD METER READING/SCALE        13.5/ 2         13.3/ 2         13.1/ 2
    HC   BACKGRD PPM                        13              13              13
    CO   SAMPLE  METER READING/SCALE        69.9/11         54.5/12         76.3/13
    CO   SAMPLE  PPM                        298             121             75
    CO   BACKGRD METER READING/SCALE         1.0/11          1.3/12          2.9/13
    CO   BACKGRD PPM                        3               2               3
    CO2  SAMPLE  METER READING/SCALE        41.7/ 2         64.5/ 3         83.4/ 3
    CO2  SAMPLE  PERCENT                    1.83            1.15            1.54
    CO2  BACKGRD METER READING/SCALE         1.3/ 2          3.7/ 3          3.8/ 3
    CO2  BACKGRD PERCENT                    .05             .06             .06
    NOX  SAMPLE  METER READING/SCALE        42.5/ 2         10.0/ 2         27.3/ 2
    NOX  SAMPLE  PPM                        42.5            10.0            27.3
    NOX  BACKGRD METER READING/SCALE          .9/ 2           .6/ 2           .9/ 2
    NOX  BACKGRD PPM                        .9              .6              .9
    SO2  SAMPLE  METER READING/SCALE       -0.0/-0         -0.0/-0         -0.0/-0
    SO2  SAMPLE  PPM                       -0.0            -0.0            -0.0
    SO2  BACKGRD METER READING/SCALE       -0.0/-0         -0.0/-0         -0.0/-0
    SO2  BACKGRD PPM                       -0.0            -0.0            -0.0

    HC   CONCENTRATION PPM                  76              24              40
    CO   CONCENTRATION PPM                  279             114             69
    CO2  CONCENTRATION PCT                  1.79            1.10            1.49
    NOX  CONCENTRATION PPM                  41.7            9.5             26.5
    SO2  CONCENTRATION PPM                  0.0             0.0             0.0
    HC   MASS GRAMS                         3.26            1.77            1.73
    CO   MASS GRAMS                         24.17           16.89           5.97
    CO2  MASS GRAMS                       2437.79         2572.56         2026.14
    NOX  MASS GRAMS                         6.56            2.55            4.16
    SO2  MASS GRAMS                         0.00            0.00            0.00
    HC GRAMS/KM (GRAMS/MILE)                .56 (   .91)    .29 (   .46)    .30 (   .48)
    CO GRAMS/KM (GRAMS/MILE)               4.17 (  6.71)   2.73 (  4.40)   1.03 (  1.66)
    CO2 GRAMS/KM (GRAMS/MILE)            420.61 (676.76) 416.29 (669.80) 349.50 (562.35)
    NOX GRAMS/KM (GRAMS/MILE)              1.13 (  1.82)    .41 (   .66)    .72 (  1.15)
    FUEL CONSUMPTION BY CB  L/100KM (MPG) 18.31 ( 12.85)  17.99 ( 13.08)  15.03 ( 15.65)
    CVS FLOW STD. CU. METRES (SCF)         74.5 (2629.3)  127.6 (4505.9)   74.3 (2624.8)
    CALCULATED DISTANCE KM(MILES)          5.80 (  3.60)   6.18 (  3.84)   5.80 (  3.60)


WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)      17.24 ( 13.65)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)              .35 (   .56)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)             2.56 (  4.12)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)          398.76 (641.61)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)             .65 (  1.04)
    TOTAL CVS FLOW =   276.4 STD. CU. METRES
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      TABLE       EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                           VEHICLE NUMBER  26

DATE  5/17/78              TIME   325 HRS.         TEST NO.  2
MODEL  1975 CHEVY NOVA     SET-7                   ENGINE 5.7 LITREV 8
DRIVER   TJ                TEST WT.  1814 KG.      GVW    0 KG
WET BULB TEMP  19 C        DRY BULB TEMP  27 C     REL. HUM.  47.8 PCT
SPEC. HUM.  10.8 GRAM/KG   BARO.  732.5 MM  HG.    MEASURED FUEL  0.00 KG
DISTANCE  21.818 KM          FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

  RUN DURATION           23.29 MINUTES
  BLOWER INLET PRESS.    762.0  MM. H20
  BLOWER DIF.  PRESS.    762.0  MM  H20
  BLOWER INLET TEMP.       43  DEG. C
  DYNO REVOLUTIONS     31708
  BLOWER REVOLUTIONS    112273
  BLOWER CU. CM /REV.   2227

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE             35.6/ 2
   HC   SAMPLE  PPM                               36
   HC   BACKGRD METER READING/SCALE             13.9/ 2
   HC   BACKGRD PPM                               14
   CO   SAMPLE  METER READING/SCALE             30.1/13
   CO   SAMPLE  PPM                               28
   CO   BACKGRD METER READING/SCALE              3.2/13
   CO   BACKGRD PPM                                3
   CO2  SAMPLE  METER READING/SCALE             41.2/ 2
   CO2  SAMPLE  PERCENT                         1.80
   CO2  BACKGRD METER READING/SCALE              1.5/ 2
   CO2  BACKGRD PERCENT                          .05
   NOX  SAMPLE  METER READING/SCALE             40.2/ 2
   NOX  SAMPLE  PPM                             40.2
   NOX  BACKGRD METER READING/SCALE              1.0/ 2
   NOX  BACKGRD PPM                              1.0
   HC   CONCENTRATION PPM                         24
   CO   CONCENTRATION PPM                         24
   CO2  CONCENTRATION PCT                       1.76
   NOX  CONCENTRATION PPM                       39.3
   SO2  COCENTRATION PPM                         0.0
   HC   MASS (GRAMS)                            2.80
   CO   MASS (GRAMS)                            5.84
   CO2  MASS (GRAMS)                         6614.40
   NOX  MASS (GRAMS)                           15.52
   SO2  MASS (GRAMS)                            0.00

HC   GRAMS/KM (GRAMS/MILE)         .13 (    .21)
CO   GRAMS/KM (GRAMS/MILE)         .27 (    .43)
CO2  GRAMS/KM (GRAMS/MILE)         303 (    488)
NOX  GRAMS/KM (GRAMS/MILE)         .71 (   1.14)
SO2  GRAMS/KM (GRAMS/MILE)        0.00 (   0.00)

HC   GRAMS/KG OF FUEL    1.34     HC   GRAMS/MIN     .12
CO   GRAMS/KG OF FUEL     2.8     CO   GRAMS/MIN      .3
CO2  GRAMS/KG OF FUEL    3161     CO2  GRAMS/MIN     284
NOX  GRAMS/KG OF FUEL    7.42     NOX  GRAMS/MIN     .67
SO2  GRAMS/KG OF FUEL    0.00     SO2  GRAMS/MIN    0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      12.97 ( 18.13)

TOTAL CVS FLOW=   205.9STD. CU. METRES
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      TABLE       EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER  26

DATE  5/17/78              TIME   325 HRS.          TEST NO.  2
MODEL  1975 CHEVY NOVA     SET-7                    ENGINE 5.7 LITREO
RUN DURATION   23.29 MIN.  DISTANCE DRIVEN  21.77 KILOMETRES
CVS BLOWER TEST VOL.  250.02 ACT. CU. METRES

                             SAMPLE                  BACKGROUND
SULFATE DATA                 ------                  ----------

 FILTER NO.                 47FH-2935
 SAMPLE VOL. CU. FT.          17.51                       1.00
 SAMPLE TEMP. DEG. F             87                         70
 SAMPLE AREA SQ. IN.       72734.00                       0.00
 DILUTION FACTOR                  1                          1
 STAND. DEN. MICROG/ML         5.00                       1.00
 STAND. AREA SQ. IN.      156539.00                       1.00
 SO4,MICROG/FILTER           23.232                      0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.           1.00                       1.00
 SAMPLE TEMP. DEG. F             70                         70
 AREA,BUBBLER 1                0.00                       0.00
 DIL. FACT.,BUBBLER 1             1                          1
 AREA,BUBBLER 2                0.00                       0.00
 DIL. FACT.,BUBBLER 2             1                          1
 STAND. DEN. MICROG/ML         1.00                       1.00
 STAND. AREA,SQ. IN.           1.00                       1.00
 SO2, MILLIG/BUBBLER 1        0.000                      0.000
 SO2, MILLIG/BUBBLER 2        0.000                      0.000
 SO2, PPM                       0.0                        0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST            13.242
 NET H2SO4,MILLIGRAM/TEST              13.520
 NET SO2,GRAM/TEST                      0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         .608
 NET H2SO4,MILLIGRAM/KILOMETRE           .621
 NET SO2,GRAM/KILOMETRE                 0.000

SULFUR BALANCE
 FUEL WT., 2102 GRAMS     SULFUR IN FUEL, .0310 PCT.
                            FUEL      SO2       H2SO4       SO2 + H2SO4
                            ----     -----     -------     -----------
            SULFUR,GRAMS     .65     0.000      .0044           .0044
            PCT. RECOVERY             0.00        .68             .68
      TABLE        FXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER  26

DATE  5/17/78              TIME     -0 HRS.          TEST NO.  3
MODEL  1975 CHEVY NOVA     HFET                      ENGINE 5.7 LITRE  8
DRIVER   TJ                TEST WT.  1814 KG.        GVW    0 KG
WET BULB TEMP  21 C        DRY BULB TEMP  28 C       REL. HUM.  55.3 PCT
SPEC. HUM.  13.4 GRAM/KG   BARO.  732.5 MM  HG.      MEASURED FUEL  0.00 KG
DISTANCE  16.413 KM           FUEL 738.2 G/LITRE     FUEL HC  RATIO 1.860

  RUN DURATION            12.76 MINUTES
  BLOWER INLET PRESS.     762.0  MM. H20
  BLOWER DIF.  PRESS.     762.0  MM  H20
  BLOWER INLET TEMP.        43  DEG. C
  DYNO REVOLUTIONS      23853
  BLOWER REVOLUTIONS      61583
  BLOWER CU. CM /REV.   2225

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE              35.4/ 2
   HC   SAMPLE  PPM                                35
   HC   BACKGRD METER READING/SCALE              13.7/ 2
   HC   BACKGRD PPM                                14
   CO   SAMPLE  METER READING/SCALE              20.6/13
   CO   SAMPLE  PPM                                20
   CO   BACKGRD METER READING/SCALE               2.8/13
   CO   BACKGRD PPM                                 3
   CO2  SAMPLE  METER READING/SCALE              49.0/ 2
   CO2  SAMPLE  PERCENT                          2.23
   CO2  BACKGRD METER READING/SCALE               1.4/ 2
   CO2  BACKGRD PERCENT                           .05
   NOX  SAMPLE  METER READING/SCALE              52.0/ 2
   NOX  SAMPLE  PPM                              52.0
   NOX  BACKGRD METER READING/SCALE                .7/ 2
   NOX  BACKGRD PPM                                .7
   HC   CONCENTRATION PPM                          24
   CO   CONCENTRATION PPM                          16
   CO2  CONCENTRATION PCT                        2.18
   NOX  CONCENTRATION PPM                        51.4
   SO2  CUCENTRATION PPM                         0.0
   HC   MASS (GRAMS)                             1.56
   CO   MASS (GRAMS)                             2.13
   CO2  MASS (GRAMS)                          4518.13
   NOX  MASS (GRAMS)                            12.19
   SO2  MASS (GRAMS)                             0.00

HC   GRAMS/KM (GRAMS/MILE)        .10 (   .15)
CO   GRAMS/KM (GRAMS/MILE)        .13 (   .21)
CO2  GRAMS/KM (GRAMS/MILE)        275 (   443)
NOX  GRAMS/KM (GRAMS/MILE)        .74 (  1.19)
SO2  GRAMS/KM (GRAMS/MILE)       0.00 (  0.00)

HC   GRAMS/KG OF FUEL   1.09     HC   GRAMS/MIN    .12
CO   GRAMS/KG OF FUEL    1.5     CO   GRAMS/MIN     .2
CO2  GRAMS/KG OF FUEL   3164     CO2  GRAMS/MIN    354
NOX  GRAMS/KG OF FUEL   8.53     NOX  GRAMS/MIN    .96
SO2  GRAMS/KG OF FUEL   0.00     SO2  GRAMS/MIN   0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      11.77 ( 19.99)

TOTAL CVS FLOW=   113.1STD. CU. METRES
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                    TABLE                  VEHICLE EMISSION RESULTS
                                          1978  LIGHT DUTY EMISSIONS TEST
                                       ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM9      TEST NO.      1       DATE  5/22/78                 MFGR. CODE    -0                    YR.  1975
VEHICLE MODEL  NOVA CHEVY                ENGINE   5.74 LITRE 8         CURB WT.      0 KG                  GVM     0 KG

BAROMETER 739.90 MM OF HG.                                            WET BULB TEMP  17.2 DEG. C
DRY BULB TEMP.   24.4 DEG. C                                           ABS. HUMIDITY   9.5 GRAMS/KG
REL. HUMIDITY     48 PCT.                                              COMMENTS  1978 FTP-C

EXHAUST EMISSIONS
                                                                      BLOWER INLET PRESS., G1 749.3 MM. H2O
     BLOWER DIF. PRESS., G2, 749.3 MM. H2O                            BLOWER INLET TEMP.    44 DEG. C
     BAG RESULTS
     BAG NO.                                    1               2               3
     BLOWER REVOLUTIONS                       40624           69461           40613
     HC   SAMPLE  METER READING/SCALE          88.8/ 2         26.3/ 2         45.3/ 2
     HC   SAMPLE  PPM                          89              26              45
     HC   BACKGRD METER READING/SCALE          11.6/ 2         11.1/ 2         11.3/ 2
     HC   BACKGRD PPM                          12              11              11
     CO   SAMPLE  METER READING/SCALE          83.1/11         88.2/13         76.8/13
     CO   SAMPLE  PPM                         389              89              76
     CO   BACKGRD METER READING/SCALE          .6/11          2.6/13          2.1/13
     CO   BACKGRD PPM                          2               3               2
     CO2  SAMPLE  METER READING/SCALE          96.1/ 3         61.5/ 3         81.4/ 3
     CO2  SAMPLE  PERCENT                      1.81            1.09            1.50
     CO2  BACKGRD METER READING/SCALE          3.4/ 3          3.4/ 3          2.1/ 3
     CO2  BACKGRD PERCENT                      .05             .05             .03
     NOX  SAMPLE  METER READING/SCALE          34.7/ 2          9.4/ 2         22.9/ 2
     NOX  SAMPLE  PPM                          34.7             9.4            22.9
     NOX  BACKGRD METER READING/SCALE          1.0/ 2          .6/ 2           .8/ 2
     NOX  BACKGRD PPM                          1.0             .6              .8
     SO2  SAMPLE  METER READING/SCALE         -0.0/-0         -0.0/-0         -0.0/-0
     SO2  SAMPLE  PPM                         -0.0            -0.0            -0.0
     SO2  BACKGRD METER READING/SCALE         -0.0/-0         -0.0/-0         -0.0/-0
     SO2  BACKGRD PPM                         -0.0            -0.0            -0.0

     HC   CONCENTRATION PPM                    79              16              35
     CO   CONCENTRATION PPM                   368              83              71
     CO2  CONCENTRATION PCT                    1.76            1.05            1.47
     NOX  CONCENTRATION PPM                    33.8            8.8             22.2
     SO2  CONCENTRATION PPM                    0.0             0.0             0.0
     HC   MASS GRAMS                           3.42            1.20            1.53
     CO   MASS GRAMS                           32.29           12.47           6.19
     CO2  MASS GRAMS                         2430.69         2465.37         2028.16
     NOX  MASS GRAMS                           4.69            2.10            3.07
     SO2  MASS GRAMS                           0.00            0.00            0.00
     HC GRAMS/KM (GRAMS/MILE)                  .60 (   .96)    .20 (   .31)    .27 (   .43)
     CO GRAMS/KM (GRAMS/MILE)                 5.63 (  9.06)   2.04 (  3.28)   1.09 (  1.75)
     CO2 GRAMS/KM (GRAMS/MILE)              424.07 (682.33) 402.53 (647.66) 355.38 (571.80)
     NOX GRAMS/KM (GRAMS/MILE)                 .82 (  1.32)    .34 (   .55)    .54 (   .87)
     FUEL CONSUMPTION BY CB  L/100KM (MPG)   18.56 ( 12.68)  17.34 ( 13.56)  15.28 ( 15.40)
     CVS FLOW STD. CU. METRES (SCF)          75.4 (2661.4)   128.8 (4550.0)   75.3 (2660.4)
     CALCULATED DISTANCE KM(MILES)            5.73 (  3.56)   6.12 (  3.81)   5.71 (  3.55)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)         17.03 ( 13.82)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                 .30 (   .48)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                2.52 (  4.06)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)             394.04 (634.01)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)                .50 (   .80)
    TOTAL CVS FLOW =   279.6 STD. CU. METRES
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EM9

DATE  5/22/78               TIME    -0 HRS.          TEST NO.  2
MODEL  1975 NOVA CHEVY      SET-7                    ENGINE 5.7 LITREV 8
DRIVER   BP                 TEST WT.  1819 KG.       GVW    0 KG
WET BULB TEMP  17 C         DRY BULB TEMP  26 C      REL. HUM.  37.5 PCT
SPEC. HUM.   8.1 GRAM/KG    BARO.  739.4 MM  HG.     MEASURED FUEL  0.00 KG
DISTANCE  21.530 KM            FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

  RUN DURATION          23.29 MINUTES
  BLOWER INLET PRESS.    749.3  MM. H2O
  BLOWER DIF.  PRESS.    749.3  MM  H2O
  BLOWER INLET TEMP.      44  DEG. C
  DYNO REVOLUTIONS     31289
  BLOWER REVOLUTIONS   115129
  BLOWER CU. CM /REV.  2233

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE              34.9/ 2
   HC  SAMPLE  PPM                                35
   HC  BACKGRD METER READING/SCALE              16.7/ 2
   HC  BACKGRD PPM                                17
   CO  SAMPLE  METER READING/SCALE              49.0/12
   CO  SAMPLE  PPM                               108
   CO  BACKGRD METER READING/SCALE               1.6/12
   CO  BACKGRD PPM                                 3
   CO2 SAMPLE  METER READING/SCALE              95.7/ 3
   CO2 SAMPLE  PERCENT                          1.80
   CO2 BACKGRD METER READING/SCALE               3.9/ 3
   CO2 BACKGRD PERCENT                           .06
   NOX SAMPLE  METER READING/SCALE              29.5/ 2
   NOX SAMPLE  PPM                              29.5
   NOX BACKGRD METER READING/SCALE                .9/ 2
   NOX BACKGRD PPM                                .9
   HC  CONCENTRATION PPM                          20
   CO  CONCENTRATION PPM                         100
   CO2 CONCENTRATION PCT                         1.75
   NOX CONCENTRATION PPM                         28.7
   SO2 COCENTRATION PPM                          0.0
   HC  MASS (GRAMS)                              2.52
   CO  MASS (GRAMS)                             24.99
   CO2 MASS (GRAMS)                           6832.69
   NOX MASS (GRAMS)                             10.81
   SO2 MASS (GRAMS)                              0.00

HC  GRAMS/KM (GRAMS/MILE)        .12 (   .19)
CO  GRAMS/KM (GRAMS/MILE)       1.16 (  1.87)
CO2 GRAMS/KM (GRAMS/MILE)        317 (   511)
NOX GRAMS/KM (GRAMS/MILE)        .50 (   .81)
SO2 GRAMS/KM (GRAMS/MILE)       0.00 (  0.00)

HC  GRAMS/KG OF FUEL   1.16     HC  GRAMS/MIN     .11
CO  GRAMS/KG OF FUEL   11.5     CO  GRAMS/MIN     1.1
CO2 GRAMS/KG OF FUEL   3148     CO2 GRAMS/MIN     293
NOX GRAMS/KG OF FUEL   4.98     NOX GRAMS/MIN     .46
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN    0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      13.64 ( 17.25)

TOTAL CVS FLOW=   213.8STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER EM9

  DATE  5/22/78               TIME    -0 HRS.          TEST NO.  2
  MODEL  1975 NOVA CHEVY      SET-7                    ENGINE 5.7 LITREO
  RUN DURATION   23.29 MIN.   DISTANCE DRIVEN  21.74  KILOMETRES
  CVS BLOWER TEST VOL.  257.12 ACT. CU. METRES

                                  SAMPLE                      BACKGROUND
  SULFATE DATA                    ------                      ----------

   FILTER NO.                  47FH-2938
   SAMPLE VOL. CU. FT.             17.19                          1.00
   SAMPLE TEMP. DEG. F                77                            70
   SAMPLE AREA SQ. IN.          76794.00                          0.00
   DILUTION FACTOR                     1                             1
   STAND. DEN. MICROG/ML            5.00                          1.00
   STAND. AREA SQ. IN.         146657.00                          1.00
   SO4,MICROG/FILTER              26.181                         0.000

  SULFUR DIOXIDE DATA

   SAMPLE VOL. CU. FT.              1.00                          1.00
   SAMPLE TEMP. DEG. F                70                            70
   AREA,BUBBLER 1                   0.00                          0.00
   DIL. FACT.,BUBBLER 1                1                             1
   AREA,BUBBLER 2                   0.00                          0.00
   DIL. FACT.,BUBBLER 2                1                             1
   STAND. DEN. MICROG/ML            1.00                          1.00
   STAND. AREA,SQ. IN.              1.00                          1.00
   SO2, MILLIG/BUBBLER 1           0.000                         0.000
   SO2, MILLIG/BUBBLER 2           0.000                         0.000
   SO2, PPM                          0.0                           0.0

  SULFATE AND SO2 EMISSIONS

   NET SULFATE,MILLIGRAM/TEST                15.921
   NET H2SO4,MILLIGRAM/TEST                  16.255
   NET SO2,GRAM/TEST                          0.000
   NET SULFATE,MILLIGRAM/KILOMETRE             .732
   NET H2SO4,MILLIGRAM/KILOMETRE               .748
   NET SO2,GRAM/KILOMETRE                     0.000

  SULFUR BALANCE
   FUEL WT., 2180 GRAMS        SULFUR IN FUEL, .0310 PCT.
                                FUEL      SO2       H2SO4        SO2 + H2SO4
                                ----     -----     -------      -----------
             SULFUR,GRAMS        .68     0.000       .0053            .0053
             PCT. RECOVERY               0.00         .79              .79
      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EM9

DATE  5/22/78              TIME     -0 HRS.        TEST NO.  3
MODEL  1975 NOVA CHEVY     FET                     ENGINE 5.7 LITREV 8
DRIVER   BP                TEST WT.  1814 KG.      GVW     0 KG
WET BULB TEMP  17 C        DRY BULB TEMP  26 C     REL. HUM.  40.6 PCT
SPEC. HUM.   8.8 GRAM/KG   BARO.  739.4 MM  HG.    MEASURED FUEL  0.00 KG
DISTANCE  16.285 KM          FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

  RUN DURATION          12.75 MINUTES
  BLOWER INLET PRESS.    749.3  MM. H2O
  BLOWER DIF.  PRESS.    749.3  MM  H2O
  BLOWER INLET TEMP.      44  DEG. C
  DYNO REVOLUTIONS     23667
  BLOWER REVOLUTIONS     61391
  BLOWER CU. CM /REV.  2230

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE            39.9/ 2
   HC   SAMPLE  PPM                              40
   HC   BACKGRD METER READING/SCALE            17.9/ 2
   HC   BACKGRD PPM                              18
   CO   SAMPLE  METER READING/SCALE            60.6/13
   CO   SAMPLE  PPM                              58
   CO   BACKGRD METER READING/SCALE             2.6/13
   CO   BACKGRD PPM                               3
   CO2  SAMPLE  METER READING/SCALE            49.7/ 2
   CO2  SAMPLE  PERCENT                        2.27
   CO2  BACKGRD METER READING/SCALE             2.5/ 2
   CO2  BACKGRD PERCENT                         .09
   NOX  SAMPLE  METER READING/SCALE            40.3/ 2
   NOX  SAMPLE  PPM                            40.3
   NOX  BACKGRD METER READING/SCALE              .9/ 2
   NOX  BACKGRD PPM                              .9
   HC   CONCENTRATION PPM                        25
   CO   CONCENTRATION PPM                        53
   CO2  CONCENTRATION PCT                      2.19
   NOX  CONCENTRATION PPM                      39.6
   SO2  COCENTRATION PPM                       0.0
   HC   MASS (GRAMS)                           1.64
   CO   MASS (GRAMS)                           7.02
   CO2  MASS (GRAMS)                        4563.03
   NOX  MASS (GRAMS)                           8.09
   SO2  MASS (GRAMS)                           0.00

HC   GRAMS/KM (GRAMS/MILE)         .10 (    .16)
CO   GRAMS/KM (GRAMS/MILE)         .43 (    .69)
CO2  GRAMS/KM (GRAMS/MILE)         280 (    451)
NOX  GRAMS/KM (GRAMS/MILE)         .50 (    .80)
SO2  GRAMS/KM (GRAMS/MILE)        0.00 (   0.00)

HC   GRAMS/KG OF FUEL   1.14     HC   GRAMS/MIN    .13
CO   GRAMS/KG OF FUEL    4.9     CO   GRAMS/MIN     .6
CO2  GRAMS/KG OF FUEL   3158     CO2  GRAMS/MIN    358
NOX  GRAMS/KG OF FUEL   5.60     NOX  GRAMS/MIN    .63
SO2  GRAMS/KG OF FUEL   0.00     SO2  GRAMS/MIN   0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      12.00 ( 19.60)

TOTAL CVS FLOW=   113.9STD. CU. METRES
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APPENDIX E

COMPUTER PRINTOUTS
FOR
THREEWAY CATALYST SYSTEM OPTIMIZATION AND DURABILITY TESTS ON THE 1977 PLYMOUTH FURY

(Tests in Chronological Order)

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                    TABLE                   VEHICLE EMISSION RESULTS
                                        1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  EM8      TEST NO.   8         DATE  3/30/77                 MFGR. CODE   -0               YR.  1977
VEHICLE MODEL  PLYMOUTH FURY            ENGINE   5.90 LITRE 8         CURB WT.      0 KG            GVM      0 KG

BAROMETER 740.92 MM OF HG.                                       WET BULB TEMP  13.9 DEG. C
DRY BULB TEMP.   24.4 DEG. C                                      ABS. HUMIDITY   5.6 GRAMS/KG
REL. HUMIDITY     29 PCT.

EXHAUST EMISSIONS
                                                                 BLOWER INLET PRESS., G1 711.2 MM. H2O
    BLOWER DIF. PRESS., G2, 711.2 MM. H2O                        BLOWER INLET TEMP.   43 DEG. C
    BAG RESULTS
    BAG NO.                                        1            2            3
    BLOWER REVOLUTIONS                           42420        74713        43029
    HC    SAMPLE  METER READING/SCALE             32.9/ 3      16.1/ 3      21.5/ 3
    HC    SAMPLE  PPM                            329          161          215
    HC    BACKGRD METER READING/SCALE               .6/ 3       1.0/ 3        .6/ 3
    HC    BACKGRD PPM                              6           10            6
    CO    SAMPLE  METER READING/SCALE             85.4/ 3      25.6/ 3      38.0/ 3
    CO    SAMPLE  PPM                           2377          596          911
    CO    BACKGRD METER READING/SCALE               .1/ 3        .1/ 3        .1/ 3
    CO    BACKGRD PPM                              2            2            2
    CO2   SAMPLE  METER READING/SCALE             43.8/ 2      32.1/ 2      42.1/ 2
    CO2   SAMPLE  PERCENT                        1.94         1.34         1.85
    CO2   BACKGRD METER READING/SCALE              1.7/ 2       1.7/ 2       1.3/ 2
    CO2   BACKGRD PERCENT                         .06          .06          .05
    NOX   SAMPLE  METER READING/SCALE             70.0/ 3      49.1/ 3      91.9/ 3
    NOX   SAMPLE  PPM                          210.0        147.3        275.7
    NOX   BACKGRD METER READING/SCALE               .1/ 3        .3/ 3        .2/ 3
    NOX   BACKGRD PPM                              .3           .9           .6
    SO2   SAMPLE  METER READING/SCALE            -0.0/-0      -0.0/-0      -0.0/-0
    SO2   SAMPLE  PPM                            -0.0         -0.0         -0.0
    SO2   BACKGRD METER READING/SCALE            -0.0/-0      -0.0/-0      -0.0/-0
    SO2   BACKGRD PPM                            -0.0         -0.0         -0.0

    HC    CONCENTRATION PPM                       324          152          210
    CO    CONCENTRATION PPM                      2264          574          868
    CO2   CONCENTRATION PCT                      1.89         1.29         1.81
    NOX   CONCENTRATION PPM                     209.7        146.5        275.2
    SO2   CONCENTRATION PPM                       0.0          0.0          0.0
    HC    MASS GRAMS                            14.83        12.26         9.74
    CO    MASS GRAMS                           209.24        93.35        81.39
    CO2   MASS GRAMS                          2756.70      3311.78      2678.98
    NOX   MASS GRAMS                            27.28        33.55        36.30
    SO2   MASS GRAMS                             0.00         0.00         0.00

    WEIGHTED MASS HC       2.00 GRAMS/KILOMETRE
    WEIGHTED MASS CO      19.04 GRAMS/KILOMETRE
    WEIGHTED MASS CO2    499.21 GRAMS/KILOMETRE
    WEIGHTED MASS NOX      5.47 GRAMS/KILOMETRE
    WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

  CARBON BALANCE FUEL CONSUMPTION = 22.81 LITRES PER HUNDRED KILOMETRES
  TOTAL CVS FLOW =   299.7 STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER

DATE  3/30/77                TIME     -0 HRS.         TEST NO.  2
MODEL  1977 PLYMOUTH FURY    SET 7                    ENGINE 5.9 LITRE  8
DRIVER   SH                  TEST WT.  2177 KG.       GVW    0 KG
WET BULB TEMP  16 C          DRY BULB TEMP  26 C      REL. HUM.  31.5 PCT
SPEC. HUM.   6.8 GRAM/KG     BARO.  741.7 MM  HG.     MEASURED FUEL  0.00 KG

  RUN DURATION          24.31 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H20
  BLOWER DIF.  PRESS. 736.6  MM  H20
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    34885
  BLOWER REVOLUTIONS   117184
  BLOWER CU. CM /REV.  2230

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE            20.6/3
   HC   SAMPLE  PPM                             206
   HC   BACKGRD METER READING/SCALE              .9/3
   HC   BACKGRD PPM                               9
   CO   SAMPLE  METER READING/SCALE            41.8/3
   CO   SAMPLE  PPM                            1010
   CO   BACKGRD METER READING/SCALE              .1/3
   CO   BACKGRD PPM                               2
   CO2 SAMPLE  METER READING/SCALE             44.8/2
   CO2 SAMPLE  PERCENT                         1.99
   CO2 BACKGRD METER READING/SCALE              1.4/2
   CO2 BACKGRD PERCENT                          .05
   NOX SAMPLE  METER READING/SCALE             28.0/4
   NOX SAMPLE  PPM                            280.0
   NOX BACKGRD METER READING/SCALE               .1/4
   NOX BACKGRD PPM                              1.0
   HC   CONCENTRATION PPM                       198
   CO   CONCENTRATION PPM                       960
   CO2 CONCENTRATION PCT                       1.95
   NOX CONCENTRATION PPM                      279.2
   SO2 COCENTRATION PPM                         0.0
   HC   MASS (GRAMS)                          25.01
   CO   MASS (GRAMS)                         244.19
   CO2 MASS (GRAMS)                         7844.09
   NOX MASS (GRAMS)                          103.28
   SO2 MASS (GRAMS)                            0.00

 HC  GRAMS/KILOMETRE       1.04
 CO  GRAMS/KILOMETRE      10.15
 CO2 GRAMS/KILOMETRE    326
 NOX GRAMS/KILOMETRE       4.29
 SO2 GRAMS/KILOMETRE       0.00

 HC  GRAMS/KG OF FUEL    9.54     HC  GRAMS/MIN   1.03
 CO  GRAMS/KG OF FUEL    93.2     CO  GRAMS/MIN   10.0
 CO2 GRAMS/KG OF FUEL    2993     CO2 GRAMS/MIN    323
 NOX GRAMS/KG OF FUEL   39.40     NOX GRAMS/MIN   4.25
 SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN   0.00
 CARBON BALANCE FUEL ECONOMY =   14.83 LITRES PER HUNDRED KILOMETERS
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                           VEHICLE NUMBER

DATE  3/30/77                  TIME    -0 HRS.        TEST NO.  2
MODEL  1977 PLYMOUTH FURY  SET 7                      ENGINE 5.9 LITREO
RUN DURATION   24.31 MIN.  DISTANCE DRIVEN  24.05 KILOMETRES
CVS BLOWER TEST VOL.  261.30 ACT. CU. METRES

                               SAMPLE                 BACKGROUND
SULFATE DATA                   ------                 ----------

 FILTER NO.                  47FH-2798
 SAMPLE VOL. CU. FT.            12.19                     1.00
 SAMPLE TEMP. DEG. F               81                       70
 SAMPLE AREA SQ. IN.        127790.00                     0.00
 DILUTION FACTOR                    1                        1
 STAND. DEN. MICROG/ML           5.00                     1.00
 STAND. AREA SQ. IN.        216575.00                     1.00
 SO4,MICROG/FILTER             29.502                    0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.             1.00                     1.00
 SAMPLE TEMP. DEG. F               70                       70
 AREA,BUBBLER 1                  0.00                     0.00
 DIL. FACT.,BUBBLER 1               1                        1
 AREA,BUBBLER 2                  0.00                     0.00
 DIL. FACT.,BUBBLER 2               1                        1
 STAND. DEN. MICROG/ML           1.00                     1.00
 STAND. AREA,SQ. IN.             1.00                     1.00
 SO2, MILLIG/BUBBLER 1          0.000                    0.000
 SO2, MILLIG/BUBBLER 2          0.000                    0.000
 SO2, PPM                         0.0                      0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST              25.433
 NET H2SO4,MILLIGRAM/TEST                25.967
 NET SO2,GRAM/TEST                        0.000
 NET SULFATE,MILLIGRAM/KILOMETRE          1.057
 NET H2SO4,MILLIGRAM/KILOMETRE            1.080
 NET SO2,GRAM/KILOMETRE                   0.000

SULFUR BALANCE
 FUEL WT., 2621 GRAMS      SULFUR IN FUEL, .0320 PCT.
                             FUEL      SO2      H2SO4      SO2 + H2SO4
                             ----     -----    -------    -----------
             SULFUR,GRAMS     .84     0.000      .0085          .0085
             PCT. RECOVERY             0.00       1.01           1.01
      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER

DATE  3/30/77              TIME    -0 HRS.         TEST NO.  3
MODEL  1977 PLYMOUTH FURY  H FET                   ENGINE 5.9 LITREV 8
DRIVER   SR                TEST WT.  2177 KG.      GVW    0 KG
WET BULB TEMP  16 C        DRY BULB TEMP  28 C     REL. HUM.  23.8 PCT
SPEC. HUM.   5.8 GRAM/KG   BARO.  741.7 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION          15.10 MINUTES
  BLOWER INLET PRESS. 723.9  MM. H2O
  BLOWER DIF.  PRESS. 723.9  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS     28935
  BLOWER REVOLUTIONS    72859
  BLOWER CU. CM /REV.  2231

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE           23.0/3
   HC  SAMPLE  PPM                            230
   HC  BACKGRD METER READING/SCALE              .8/3
   HC  BACKGRD PPM                              8
   CO  SAMPLE  METER READING/SCALE           44.7/3
   CO  SAMPLE  PPM                           1087
   CO  BACKGRD METER READING/SCALE            0.0/3
   CO  BACKGRD PPM                              0
   CO2 SAMPLE  METER READING/SCALE           50.6/2
   CO2 SAMPLE  PERCENT                       2.32
   CO2 BACKGRD METER READING/SCALE            1.4/2
   CO2 BACKGRD PERCENT                        .05
   NOX SAMPLE  METER READING/SCALE           36.2/4
   NOX SAMPLE  PPM                          362.0
   NOX BACKGRD METER READING/SCALE             .1/4
   NOX BACKGRD PPM                            1.0
   HC  CONCENTRATION PPM                      223
   CO  CONCENTRATION PPM                     1030
   CO2 CONCENTRATION PCT                     2.28
   NOX CONCENTRATION PPM                    361.2
   SO2 COCENTRATION PPM                       0.0
   HC  MASS (GRAMS)                         17.55
   CO  MASS (GRAMS)                        163.36
   CO2 MASS (GRAMS)                       5695.87
   NOX MASS (GRAMS)                         81.00
   SO2 MASS (GRAMS)                          0.00

HC  GRAMS/KILOMETRE      .88
CO  GRAMS/KILOMETRE     8.19
CO2 GRAMS/KILOMETRE   286
NOX GRAMS/KILOMETRE     4.06
SO2 GRAMS/KILOMETRE     0.00

HC  GRAMS/KG OF FUEL   9.26     HC  GRAMS/MIN   1.16
CO  GRAMS/KG OF FUEL   86.2     CO  GRAMS/MIN   10.8
CO2 GRAMS/KG OF FUEL   3005     CO2 GRAMS/MIN    377
NOX GRAMS/KG OF FUEL  42.73     NOX GRAMS/MIN   5.36
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   12.93 LITRES PER HUNDRED KILOMETERS
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                       TABLE                    VEHICLE EMISSION RESULTS
                                           1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.    8        TEST NO. 1          DATE  8/17/77                 MFGR. CODE   -0              YR.  1977
VEHICLE MODEL  PLYMOUTH  SALON           ENGINE   5.90 LITRE 8         CURB WT.     0 KG            GVM     0 KG

BAROMETER 742.95 MM OF HG.                                          WET BULB TEMP  19.4 DEG. C
DRY BULB TEMP.    25.0 DEG. C                                        ABS. HUMIDITY  12.1 GRAMS/KG
REL. HUMIDITY     60 PCT.

EXHAUST EMISSIONS                                                   BLOWER INLET PRESS., G1 736.6 MM. H2O
                                                                    BLOWER INLET TEMP.   43 DEG. C
    BLOWER DIF. PRESS., G2, 736.6 MM. H2O
    BAG RESULTS
    BAG NO.                                     1              2              3
    BLOWER REVOLUTIONS                       40714          69730          40645
    HC    SAMPLE  METER READING/SCALE         13.5/3         18.3/2         32.1/2
    HC    SAMPLE  PPM                         135            18             32
    HC    BACKGRD METER READING/SCALE          1.5/3          1.5/3         14.5/2
    HC    BACKGRD PPM                         15             15             14
    CO    SAMPLE  METER READING/SCALE        55.0/3         11.2/*         70.0/*
    CO    SAMPLE  PPM                        1370            11             71
    CO    BACKGRD METER READING/SCALE          .3/3           .2/3          2.3/*
    CO    BACKGRD PPM                          6              4              2
    CO2   SAMPLE  METER READING/SCALE        88.0/3         64.2/3         83.0/3
    CO2   SAMPLE  PERCENT                    1.64           1.15           1.53
    CO2   BACKGRD METER READING/SCALE         4.4/3          4.5/3          4.8/3
    CO2   BACKGRD PERCENT                     .07            .07            .07
    NOX   SAMPLE  METER READING/SCALE        27.7/2         13.0/2         22.7/2
    NOX   SAMPLE  PPM                        27.7           13.0           22.7
    NOX   BACKGRD METER READING/SCALE         3.1/2          1.9/2          1.7/2
    NOX   BACKGRD PPM                         3.1            1.9            1.7
    SO2   SAMPLE  METER READING/SCALE        -0.0/*         -0.0/*         -0.0/*
    SO2   SAMPLE  PPM                        -0.0           -0.0           -0.0
    SO2   BACKGRD METER READING/SCALE        -0.0/*         -0.0/*         -0.0/*
    SO2   BACKGRD PPM                        -0.0           -0.0           -0.0

    HC    CONCENTRATION PPM                   122              5             19
    CO    CONCENTRATION PPM                  1295              6             66
    CO2   CONCENTRATION PCT                  1.58           1.08           1.47
    NOX   CONCENTRATION PPM                  25.0           11.3           21.2
    SO2   CONCENTRATION PPM                   0.0            0.0            0.0
    HC    MASS GRAMS                         5.36            .35            .84
    CO    MASS GRAMS                       114.82            .96           5.82
    CO2   MASS GRAMS                      2209.67        2599.12        2050.59
    NOX   MASS GRAMS                         3.81           2.94           3.23
    SO2   MASS GRAMS                         0.00           0.00           0.00

    WEIGHTED MASS HC        .26 GRAMS/KILOMETRE
    WEIGHTED MASS CO       4.45 GRAMS/KILOMETRE
    WEIGHTED MASS CO2    390.98 GRAMS/KILOMETRE
    WEIGHTED MASS NOX       .53 GRAMS/KILOMETRE
    WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

   CARBON BALANCE FUEL CONSUMPTION = 17.00 LITRES PER HUNDRED KILOMETRES
   TOTAL CVS FLOW =   282.7 STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER   8

DATE  8/17/77                 TIME     -0 HRS.         TEST NO.  2
MODEL  1977 PLYMOUTH/SALON SET-7                       ENGINE 5.9 LITREV 8
DRIVER   SR                   TEST WT.  2041 KG.       GVW    0 KG
WET BULB TEMP  18 C           DRY BULB TEMP  26 C      REL. HUM.  46.3 PCT
SPEC. HUM.   9.7 GRAM/KG      BARO.  742.2 MM  HG.     MEASURED FUEL  0.00 KG

  RUN DURATION          23.28 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H2O
  BLOWER DIF.  PRESS. 736.6  MM  H2O
  BLOWER INLET TEMP.      43  DEG. C
  DYNO REVOLUTIONS     32069
  BLOWER REVOLUTIONS   112305
  BLOWER CU. CM /REV.  2228

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE           40.6/2
   HC   SAMPLE  PPM                             41
   HC   BACKGRD METER READING/SCALE           18.7/2
   HC   BACKGRD PPM                             19
   CO   SAMPLE  METER READING/SCALE           72.9/*
   CO   SAMPLE  PPM                            317
   CO   BACKGRD METER READING/SCALE            4.3/*
   CO   BACKGRD PPM                             13
   CO2 SAMPLE  METER READING/SCALE            95.3/3
   CO2 SAMPLE  PERCENT                        1.79
   CO2 BACKGRD METER READING/SCALE             4.1/3
   CO2 BACKGRD PERCENT                         .06
   NOX SAMPLE  METER READING/SCALE             8.0/2
   NOX SAMPLE  PPM                             8.0
   NOX BACKGRD METER READING/SCALE             1.7/2
   NOX BACKGRD PPM                             1.7
   HC  CONCENTRATION PPM                       24
   CO  CONCENTRATION PPM                      290
   CO2 CONCENTRATION PCT                      1.74
   NOX CONCENTRATION PPM                       6.5
   SO2 COCENTRATION PPM                       0.0
   HC  MASS (GRAMS)                           2.96
   CO  MASS (GRAMS)                          70.90
   CO2 MASS (GRAMS)                        6695.37
   NOX MASS (GRAMS)                           2.53
   SO2 MASS (GRAMS)                           0.00

HC  GRAMS/KILOMETRE      .14
CO  GRAMS/KILOMETRE     3.26
CO2 GRAMS/KILOMETRE   308
NOX GRAMS/KILOMETRE      .12
SO2 GRAMS/KILOMETRE     0.00

HC  GRAMS/KG OF FUEL   1.38     HC  GRAMS/MIN     .13
CO  GRAMS/KG OF FUEL   33.0     CO  GRAMS/MIN    3.0
CO2 GRAMS/KG OF FUEL   3113     CO2 GRAMS/MIN    288
NOX GRAMS/KG OF FUEL   1.18     NOX GRAMS/MIN    .11
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   13.40 LITRES PER HUNDRED KILOMETERS
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER   8

DATE  8/17/77                  TIME    -0 HRS.        TEST NO.  2
MODEL  1977 PLYMOUTH/SALON SET-7                      ENGINE 5.9 LITREO
RUN DURATION   23.28 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  250.24 ACT. CU. METRES

                               SAMPLE                 BACKGROUND
SULFATE DATA                   ------                 ----------

 FILTER NO.                 47FH-2858
 SAMPLE VOL. CU. FT.            13.68                     1.00
 SAMPLE TEMP. DEG. F               80                       70
 SAMPLE AREA SQ. IN.         55028.00                     0.00
 DILUTION FACTOR                    1                        1
 STAND. DEN. MICROG/ML           5.00                     1.00
 STAND. AREA SQ. IN.        195896.00                     1.00
 SO4,MICROG/FILTER             14.045                    0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.             1.00                     1.00
 SAMPLE TEMP. DEG. F               70                       70
 AREA,BUBBLER 1                  0.00                     0.00
 DIL. FACT.,BUBBLER 1               1                        1
 AREA,BUBBLER 2                  0.00                     0.00
 DIL. FACT.,BUBBLER 2               1                        1
 STAND. DEN. MICROG/ML           1.00                     1.00
 STAND. AREA,SQ. IN.             1.00                     1.00
 SO2, MILLIG/BUBBLER 1          0.000                    0.000
 SO2, MILLIG/BUBBLER 2          0.000                    0.000
 SO2, PPM                         0.0                      0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST             10.330
 NET H2SO4,MILLIGRAM/TEST               10.547
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE          .475
 NET H2SO4,MILLIGRAM/KILOMETRE            .485
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2151 GRAMS      SULFUR IN FUEL, .0300 PCT.
                            FUEL     SO2      H2SO4      SO2 + H2SO4
                            ----    -----    -------    ------------
             SULFUR,GRAMS    .65    0.000     .0034          .0034
             PCT. RECOVERY          0.00       .53            .53
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER   8

DATE  8/17/77                 TIME    -0 HRS.         TEST NO.  3
MODEL  1977 PLYMOUTH/SALON FET                        ENGINE 5.9 LITREV 8
DRIVER   SR                   TEST WT.  2041 KG.      GVW    0 KG
WET BULB TEMP  18 C           DRY BULB TEMP  26 C     REL. HUM.  43.7 PCT
SPEC. HUM.   9.4 GRAM/KG      BARO.  742.2 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION          12.78 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H2O
  BLOWER DIF.  PRESS. 736.6  MM  H2O
  BLOWER INLET TEMP.      43  DEG. C
  DYNO REVOLUTIONS    24211
  BLOWER REVOLUTIONS     61735
  BLOWER CU. CM /REV.  2228

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE           51.1/2
   HC   SAMPLE  PPM                             51
   HC   BACKGRD METER READING/SCALE           18.8/2
   HC   BACKGRD PPM                             19
   CO   SAMPLE  METER READING/SCALE           87.6/*
   CO   SAMPLE  PPM                            425
   CO   BACKGRD METER READING/SCALE            6.7/*
   CO   BACKGRD PPM                             21
   CO2 SAMPLE  METER READING/SCALE           48.3/2
   CO2 SAMPLE  PERCENT                       2.19
   CO2 BACKGRD METER READING/SCALE            2.1/2
   CO2 BACKGRD PERCENT                         .08
   NOX SAMPLE  METER READING/SCALE           10.4/2
   NOX SAMPLE  PPM                           10.4
   NOX BACKGRD METER READING/SCALE            1.9/2
   NOX BACKGRD PPM                            1.9
   HC   CONCENTRATION PPM                       35
   CO   CONCENTRATION PPM                      384
   CO2 CONCENTRATION PCT                     2.12
   NOX CONCENTRATION PPM                      8.8
   SO2 COCENTRATION PPM                      0.0
   HC   MASS (GRAMS)                         2.36
   CO   MASS (GRAMS)                        51.57
   CO2 MASS (GRAMS)                      4504.06
   NOX MASS (GRAMS)                         1.87
   SO2 MASS (GRAMS)                         0.00

HC   GRAMS/KILOMETRE      .14
CO   GRAMS/KILOMETRE     3.13
CO2 GRAMS/KILOMETRE   273
NOX GRAMS/KILOMETRE      .11
SO2 GRAMS/KILOMETRE     0.00

HC   GRAMS/KG OF FUEL   1.63     HC   GRAMS/MIN    .18
CO   GRAMS/KG OF FUEL   35.6     CO   GRAMS/MIN    4.0
CO2 GRAMS/KG OF FUEL   3108     CO2 GRAMS/MIN    352
NOX GRAMS/KG OF FUEL   1.29     NOX GRAMS/MIN    .15
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   11.91 LITRES PER HUNDRED KILOMETERS
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                         TABLE                      VEHICLE EMISSION RESULTS
                                               1975  LIGHT DUTY EMISSIONS TEST
                                                                    MFGR. CODE    -0                YR.   1977
UNIT NO.  235          TEST NO. 1          DATE  9/23/77            CURR WT.       0 KG             GVM       0 KG
VEHICLE MODEL   PLY FURY                   ENGINE    5.90 LITRE 8
                                                                 WET BULB TEMP  18.3 DEG. C
BAROMETER 739.90 MM OF HG.                                        ABS. HUMIDITY  11.6 GRAMS/KG
DRY BULB TEMP.    22.8 DEG. C
REL. HUMIDITY      65 PCT.

EXHAUST EMISSIONS                                                BLOWER INLET PRESS., G1 685.8 MM. H2O
                                                                 BLOWER INLET TEMP.   43 DEG. C
     BLOWER DIF. PRESS., G2, 685.8 MM. H2O
     BAG RESULTS
     BAG NO.                                      1              2              3
     BLOWER REVOLUTIONS                       40794          69857          40727
     HC    SAMPLE  METER READING/SCALE       90.7/2         15.1/2         26.6/2
     HC    SAMPLE  PPM                          91             15             27
     HC    BACKGRD METER READING/SCALE       11.0/2         10.4/2         10.8/2
     HC    BACKGRD PPM                          11             10             11
     CO    SAMPLE  METER READING/SCALE       28.2/3         48.1/*         83.0/*
     CO    SAMPLE  PPM                         661             45            194
     CO    BACKGRD METER READING/SCALE         .1/3          3.8/*          1.3/*
     CO    BACKGRD PPM                           2              4              2
     CO2   SAMPLE  METER READING/SCALE       91.3/3         65.0/3         85.1/3
     CO2   SAMPLE  PERCENT                   1.71           1.16           1.58
     CO2   BACKGRD METER READING/SCALE        4.1/3          4.0/3          4.0/3
     CO2   BACKGRD PERCENT                    .06            .06            .06
     NOX   SAMPLE  METER READING/SCALE       30.5/2          4.3/2         12.2/2
     NOX   SAMPLE  PPM                       30.5            4.3           12.2
     NOX   BACKGRD METER READING/SCALE        1.2/2          1.1/2          1.0/2
     NOX   BACKGRD PPM                        1.2            1.1            1.0
     SO2   SAMPLE  METER READING/SCALE      -0.0/*         -0.0/*         -0.0/*
     SO2   SAMPLE  PPM                      -0.0           -0.0           -0.0
     SO2   BACKGRD METER READING/SCALE      -0.0/*         -0.0/*         -0.0/*
     SO2   BACKGRD PPM                      -0.0           -0.0           -0.0

     HC    CONCENTRATION PPM                    81              6             17
     CO    CONCENTRATION PPM                   624             40            182
     CO2   CONCENTRATION PCT                  1.65           1.11           1.52
     NOX   CONCENTRATION PPM                  29.5            3.3           11.3
     SO2   CONCENTRATION PPM                   0.0            0.0            0.0
     HC    MASS GRAMS                         3.58            .42            .75
     CO    MASS GRAMS                        55.53           6.11          16.14
     CO2   MASS GRAMS                      2321.44        2665.13        2136.08
     NOX   MASS GRAMS                         4.44            .85           1.70
     SO2   MASS GRAMS                         0.00           0.00           0.00

     WEIGHTED MASS HC        .20 GRAMS/KILOMETRE
     WEIGHTED MASS CO       3.25 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    404.47 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .31 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.7  KILOMETRE/LITRE
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                      TABLE                       VEHICLE EMISSION RESULTS
                                              1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  235        TEST NO. *          DATE  9/28/77                      MFGR. CODE   -0                YR.  1977
VEHICLE MODEL  PLY. FURY                 ENGINE   5.90 LITRE 8              CURB WT.     0 KG              GVM     0 KG

BAROMETER 739.90 MM OF HG.                                               WET BULB TEMP  18.9 DEG. C
DRY BULB TEMP.    22.8 DEG. C                                             ABS. HUMIDITY  12.3 GRAMS/KG
REL. HUMIDITY     69 PCT.

EXHAUST EMISSIONS
                                                                         BLOWER INLET PRESS., G1 690.9 MM. H2O
     BLOWER DIF. PRESS., G2, 688.3 MM. H2O                               BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                      1             2             3
     BLOWER REVOLUTIONS                       40659         69813         40631
     HC   SAMPLE  METER READING/SCALE          9.8/3        15.6/2        18.1/2
     HC   SAMPLE  PPM                          98            16            18
     HC   BACKGRD METER READING/SCALE          1.9/3        14.0/2        13.6/2
     HC   BACKGRD PPM                          19            14            14
     CO   SAMPLE  METER READING/SCALE         32.3/3         6.9/*        11.7/*
     CO   SAMPLE  PPM                         765             7            11
     CO   BACKGRD METER READING/SCALE           .1/3          3.0/*         2.4/*
     CO   BACKGRD PPM                           2             3             2
     CO2  SAMPLE  METER READING/SCALE         90.9/3        63.5/3        84.4/3
     CO2  SAMPLE  PERCENT                     1.70          1.13          1.56
     CO2  BACKGRD METER READING/SCALE          3.7/3         3.3/3         3.4/3
     CO2  BACKGRD PERCENT                      .06           .05           .05
     NOX  SAMPLE  METER READING/SCALE         51.1/2        17.4/2        34.3/3
     NOX  SAMPLE  PPM                         51.1          17.4         102.9
     NOX  BACKGRD METER READING/SCALE           .7/2          .6/2          .3/3
     NOX  BACKGRD PPM                           .7            .6            .9
     SO2  SAMPLE  METER READING/SCALE         -0.0/*        -0.0/*        -0.0/*
     SO2  SAMPLE  PPM                         -0.0          -0.0          -0.0
     SO2  BACKGRD METER READING/SCALE         -0.0/*        -0.0/*        -0.0/*
     SO2  BACKGRD PPM                         -0.0          -0.0          -0.0

     HC   CONCENTRATION PPM                    82             3             6
     CO   CONCENTRATION PPM                   721             4             8
     CO2  CONCENTRATION PCT                   1.65          1.09          1.52
     NOX  CONCENTRATION PPM                   50.5          16.9         102.1
     SO2  CONCENTRATION PPM                    0.0           0.0           0.0
     HC   MASS GRAMS                          3.58           .21           .27
     CO   MASS GRAMS                         63.97           .57           .74
     CO2  MASS GRAMS                       2310.09       2615.20       2122.38
     NOX  MASS GRAMS                          7.78          4.46         15.72
     SO2  MASS GRAMS                          0.00          0.00          0.00

     WEIGHTED MASS HC        .16 GRAMS/KILOMETRE
     WEIGHTED MASS CO       2.36 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    399.28 GRAMS/KILOMETRE
     WEIGHTED MASS NOX      1.39 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.8  KILOMETRE/LITRE
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                              TABLE                    VEHICLE EMISSION RESULTS
                                                    1978  LIGHT DUTY EMISSIONS TEST
                                                 ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.    8      TEST NO.       1      DATE 10/20/77                   MFGR. CODE   -0                 YR.  1977
VEHICLE MODEL  FURY PLYMOUTH             ENGINE   5.90 LITRE 8           CURB WT.     0 KG               GVM      0 KG

BAROMETER 740.66 MM OF HG.                                             WET BULB TEMP  17.8 DEG. C
DRY BULB TEMP.   25.0 DEG. C                                            ABS. HUMIDITY   9.9 GRAMS/KG
REL. HUMIDITY     49 PCT.                                               COMMENTS  1978 FTP-C

EXHAUST EMISSIONS
                                                                       BLOWER INLET PRESS., G1 685.8 MM. H2O
    BLOWER DIF. PRESS., G2, 685.8 MM. H2O                              BLOWER INLET TEMP.   43 DEG. C
    BAG RESULTS
    BAG NO.                                     1               2               3
    BLOWER REVOLUTIONS                        40742           69816           40709
    HC   SAMPLE  METER READING/SCALE           10.3/ 3         24.8/ 2         28.2/ 2
    HC   SAMPLE  PPM                           103             25              28
    HC   BACKGRD METER READING/SCALE           2.2/ 3         20.1/ 2         16.0/ 2
    HC   BACKGRD PPM                           22              20              16
    CO   SAMPLE  METER READING/SCALE           32.4/ 3         71.7/13         58.3/12
    CO   SAMPLE  PPM                           767             70              130
    CO   BACKGRD METER READING/SCALE           .4/ 3         10.6/13          2.7/12
    CO   BACKGRD PPM                            9              10               5
    CO2  SAMPLE  METER READING/SCALE           90.5/ 3         66.1/ 3         85.6/ 3
    CO2  SAMPLE  PERCENT                       1.69            1.19            1.59
    CO2  BACKGRD METER READING/SCALE           3.2/ 3          3.7/ 3          3.9/ 3
    CO2  BACKGRD PERCENT                       .05             .06             .06
    NOX  SAMPLE  METER READING/SCALE           26.0/ 2          3.5/ 2         22.1/ 2
    NOX  SAMPLE  PPM                           26.0             3.5            22.1
    NOX  BACKGRD METER READING/SCALE           .5/ 2           .5/ 2          1.0/ 2
    NOX  BACKGRD PPM                           .5              .5             1.0
    SO2  SAMPLE  METER READING/SCALE           -0.0/-0         -0.0/-0         -0.0/-0
    SO2  SAMPLE  PPM                           -0.0            -0.0            -0.0
    SO2  BACKGRD METER READING/SCALE           -0.0/-0         -0.0/-0         -0.0/-0
    SO2  BACKGRD PPM                           -0.0            -0.0            -0.0

    HC   CONCENTRATION PPM                     84               6              14
    CO   CONCENTRATION PPM                     723             58              120
    CO2  CONCENTRATION PCT                     1.65            1.13            1.53
    NOX  CONCENTRATION PPM                     25.6            3.0             21.2
    SO2  CONCENTRATION PPM                     0.0             0.0             0.0
    HC   MASS GRAMS                            3.70            .49             .62
    CO   MASS GRAMS                            64.34           8.89            10.65
    CO2  MASS GRAMS                            2304.62         2718.76         2145.03
    NOX  MASS GRAMS                            3.64            .74             3.02
    SO2  MASS GRAMS                            0.00            0.00            0.00
    HC GRAMS/KM (GRAMS/MILE)                   .64 (  1.03)     .08 (   .13)     .11 (   .17)
    CO GRAMS/KM (GRAMS/MILE)                 11.08 ( 17.83)    1.42 (  2.28)    1.85 (  2.97)
    CO2 GRAMS/KM (GRAMS/MILE)               397.02 (638.81)  433.57 (697.62)  371.64 (597.97)
    NOX GRAMS/KM (GRAMS/MILE)                  .63 (  1.01)     .12 (   .19)     .52 (   .84)
    FUEL CONSUMPTION BY CB  L/100KM (MPG)    17.77 ( 13.23)   18.61 ( 12.64)   16.00 ( 14.70)
    CVS FLOW STD. CU. METRES (SCF)            76.5 (2700.0)   131.0 (4626.1)    76.4 (2697.8)
    CALCULATED DISTANCE KM(MILES)             5.80 (  3.61)    6.27 (  3.90)    5.77 (  3.59)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)          17.72 ( 13.27)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                  .20 (   .32)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                 3.53 (  5.68)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)              409.10 (658.24)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)                 .33 (   .54)
    TOTAL CVS FLOW =   283.9 STD. CU. METRES
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                                TABLE                    VEHICLE EMISSION RESULTS
                                                    1975 LIGHT DUTY EMISSIONS TEST
UNIT NO.  EMR         TEST NO. 1           DATE 11/28/77
VEHICLE MODEL  FURY PLYMOUTH               ENGINE   5.90 LITRE 8          MFCR. CODE   -0            YR.  1977
                                                                          CURB WT.     0 KG          GVM     0 KG

BAROMETER 736.60 MM OF HG.
DRY BULB TEMP.    24.4 DEG. C                                           WET BULB TEMP  15.0 DEG. C
REL. HUMIDITY      35 PCT.                                               ABS. HUMIDITY    6.9 GRAMS/KG

EXHAUST EMISSIONS

    BLOWER DIF. PRESS., G2, 660.4 MM. H2O                                BLOWER INLET PRESS., G1 660.4 MM. H2O
    BAG RESULTS                                                          BLOWER INLET TEMP.    42 DEG. C
    BAG NO.                                        1             2             3
    BLOWER REVOLUTIONS                         40791         69742         40731
    HC    SAMPLE  METER READING/SCALE            9.8/3        13.2/2        15.1/2
    HC    SAMPLE  PPM                            98            13            15
    HC    BACKGRD METER READING/SCALE            1.0/3        12.8/2        13.9/2
    HC    BACKGRD PPM                            10            13            14
    CO    SAMPLE  METER READING/SCALE           30.9/3        26.3/*        47.0/*
    CO    SAMPLE  PPM                           723            25            45
    CO    BACKGRD METER READING/SCALE            .2/3          3.9/*         3.7/*
    CO    BACKGRD PPM                             5             4             4
    CO2   SAMPLE  METER READING/SCALE           89.4/3        65.1/3        82.2/3
    CO2   SAMPLE  PERCENT                       1.67          1.16          1.52
    CO2   BACKGRD METER READING/SCALE            3.8/3         3.9/3         4.7/3
    CO2   BACKGRD PERCENT                        .06           .06           .07
    NOX   SAMPLE  METER READING/SCALE           42.8/2         8.6/2        38.1/2
    NOX   SAMPLE  PPM                           42.8           8.6          38.1
    NOX   BACKGRD METER READING/SCALE            .4/2          .5/2          .7/2
    NOX   BACKGRD PPM                            .4            .5            .7
    SO2   SAMPLE  METER READING/SCALE           -0.0/*        -0.0/*        -0.0/*
    SO2   SAMPLE  PPM                           -0.0          -0.0          -0.0
    SO2   BACKGRD METER READING/SCALE           -0.0/*        -0.0/*        -0.0/*
    SO2   BACKGRD PPM                           -0.0          -0.0          -0.0

    HC    CONCENTRATION PPM                      89             2             3
    CO    CONCENTRATION PPM                     688            21            40
    CO2   CONCENTRATION PCT                     1.61          1.11          1.45
    NOX   CONCENTRATION PPM                     42.5           8.1          37.5
    SO2   CONCENTRATION PPM                      0.0           0.0           0.0
    HC    MASS GRAMS                            3.94           .11           .12
    CO    MASS GRAMS                           61.37          3.15          3.53
    CO2   MASS GRAMS                         2274.68       2673.62       2040.99
    NOX   MASS GRAMS                            5.53          1.81          4.87
    SO2   MASS GRAMS                            0.00          0.00          0.00

    WEIGHTED MASS HC        .16 GRAMS/KILOMETRE
    WEIGHTED MASS CO       2.61 GRAMS/KILOMETRE
    WEIGHTED MASS CO2    399.01 GRAMS/KILOMETRE
    WEIGHTED MASS NOX       .58 GRAMS/KILOMETRE
    WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

    FUEL ECONOMY BY CARBON BALANCE =    5.8  KILOMETRE/LITRE
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                    TABLE                   VEHICLE EMISSION RESULTS
                                         1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  EMB        TEST NO. 1         DATE 12/13/77                      MFGR. CODE   -0                 YR.  1977
VEHICLE MODEL  PLY FURY                 ENGINE   5.90 LITRE 8              CURB WT.      0 KG              GVM     0 KG

BAROMETER 739.90 MM OF HG.                                           WET BULB TEMP  16.9 DEG. C
DRY BULB TEMP.   23.3 DEG. C                                          ABS. HUMIDITY  12.1 GRAMS/KG
REL. HUMIDITY     66 PCT.

EXHAUST EMISSIONS
                                                                     BLOWER INLET PRESS., G1 673.1 MM. H2O
     BLOWER DIF. PRESS., G2, 673.1 MM. H2O                           BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                        1              2              3
     BLOWER REVOLUTIONS                           40723          69908          40601
     HC   SAMPLE  METER READING/SCALE              12.1/3          9.5/2         14.5/2
     HC   SAMPLE  PPM                              121             10             14
     HC   BACKGRD METER READING/SCALE               .9/3           8.3/2          8.8/2
     HC   BACKGRD PPM                               9              8              9
     CO   SAMPLE  METER READING/SCALE             27.4/3          16.3/*         36.8/*
     CO   SAMPLE  PPM                             637             16             35
     CO   BACKGRD METER READING/SCALE               .1/3           4.0/*          4.2/*
     CO   BACKGRD PPM                               2              4              4
     CO2  SAMPLE  METER READING/SCALE             94.2/3          65.2/3         85.5/3
     CO2  SAMPLE  PERCENT                         1.77            1.17           1.58
     CO2  BACKGRD METER READING/SCALE              4.1/3           3.6/3          3.7/3
     CO2  BACKGRD PERCENT                          .06             .06            .06
     NOX  SAMPLE  METER READING/SCALE             26.5/2           6.3/2         30.8/2
     NOX  SAMPLE  PPM                             26.5             6.3           30.8
     NOX  BACKGRD METER READING/SCALE              1.8/2           1.9/2          1.8/2
     NOX  BACKGRD PPM                              1.8             1.9            1.8
     SO2  SAMPLE  METER READING/SCALE             -0.0/*          -0.0/*         -0.0/*
     SO2  SAMPLE  PPM                             -0.0            -0.0           -0.0
     SO2  BACKGRD METER READING/SCALE             -0.0/*          -0.0/*         -0.0/*
     SO2  BACKGRD PPM                             -0.0            -0.0           -0.0

     HC   CONCENTRATION PPM                        113             2              7
     CO   CONCENTRATION PPM                        600            11             29
     CO2  CONCENTRATION PCT                       1.71            1.12           1.53
     NOX  CONCENTRATION PPM                       24.9             4.6           29.2
     SO2  CONCENTRATION PPM                        0.0             0.0            0.0
     HC   MASS GRAMS                              5.00             .15            .30
     CO   MASS GRAMS                             53.51            1.75           2.62
     CO2  MASS GRAMS                           2410.19         2698.13        2152.90
     NOX  MASS GRAMS                              3.83            1.20           4.47
     SO2  MASS GRAMS                              0.00            0.00           0.00

     WEIGHTED MASS HC        .20 GRAMS/KILOMETRE
     WEIGHTED MASS CO       2.18 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    411.16 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .45 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.6  KILOMETRE/LITRE
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                  TABLE                    VEHICLE EMISSION RESULTS
                                        1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  235        TEST NO. *        DATE 12/16/77                MFGR. CODE   -0              YR.  1977
VEHICLE MODEL  FURY EM 8               ENGINE   5.90 LITRE 8        CURB WT.     0 KG            GVM     0 KG

BAROMETER 734.31 MM OF HG.                                      WET BULB TEMP  18.3 DEG. C
DRY BULB TEMP.    25.0 DEG. C                                    ABS. HUMIDITY  10.8 GRAMS/KG
REL. HUMIDITY     53 PCT.

EXHAUST EMISSIONS
                                                                BLOWER INLET PRESS., G1 660.4 MM. H2O
     BLOWER DIF. PRESS., G2, 660.4 MM. H2O                      BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                 1             2             3
     BLOWER REVOLUTIONS                    40758         69907         40733
     HC    SAMPLE  METER READING/SCALE      54.5/2         8.9/2        11.5/2
     HC    SAMPLE  PPM                      54             9             11
     HC    BACKGRD METER READING/SCALE       8.5/2         9.4/2         8.6/2
     HC    BACKGRD PPM                       9             9             9
     CO    SAMPLE  METER READING/SCALE      82.4/*        18.0/*        18.6/*
     CO    SAMPLE  PPM                     384            17            18
     CO    BACKGRD METER READING/SCALE       1.0/*         2.0/*         1.3/*
     CO    BACKGRD PPM                       3             2             1
     CO2   SAMPLE  METER READING/SCALE      44.2/2        70.2/3        88.3/3
     CO2   SAMPLE  PERCENT                   1.96          1.27          1.64
     CO2   BACKGRD METER READING/SCALE       2.1/2         3.9/3         4.2/3
     CO2   BACKGRD PERCENT                   .08           .06           .06
     NOX   SAMPLE  METER READING/SCALE      30.9/2         7.7/2        35.5/2
     NOX   SAMPLE  PPM                      30.9           7.7          35.5
     NOX   BACKGRD METER READING/SCALE       1.0/2          .7/2          .8/2
     NOX   BACKGRD PPM                       1.0            .7            .8
     SO2   SAMPLE  METER READING/SCALE      -0.0/*        -0.0/*        -0.0/*
     SO2   SAMPLE  PPM                      -0.0          -0.0          -0.0
     SO2   BACKGRD METER READING/SCALE      -0.0/*        -0.0/*        -0.0/*
     SO2   BACKGRD PPM                      -0.0          -0.0          -0.0

     HC    CONCENTRATION PPM                47             0             4
     CO    CONCENTRATION PPM               360            15            16
     CO2   CONCENTRATION PCT                 1.90          1.21          1.59
     NOX   CONCENTRATION PPM                30.0           7.1          34.8
     SO2   CONCENTRATION PPM                 0.0           0.0           0.0
     HC    MASS GRAMS                        2.08           .03           .17
     CO    MASS GRAMS                       31.93          2.24          1.40
     CO2   MASS GRAMS                     2655.43       2914.57       2218.58
     NOX   MASS GRAMS                        4.38          1.77          5.07
     SO2   MASS GRAMS                        0.00          0.00          0.00

     WEIGHTED MASS HC       .08 GRAMS/KILOMETRE
     WEIGHTED MASS CO      1.39 GRAMS/KILOMETRE
     WEIGHTED MASS CO2   440.94 GRAMS/KILOMETRE
     WEIGHTED MASS NOX      .54 GRAMS/KILOMETRE
     WEIGHTED MASS SO2     0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =   5.3  KILOMETRE/LITRE
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                    TABLE              VEHICLE EMISSION RESULTS
                                    1-78  LIGHT DUTY EMISSIONS TEST
                                  ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  235      TEST NO.      1      DATE 12/19/77                   MFGR. CODE   -0              YR.  1977
VEHICLE MODEL  FURY                     ENGINE   5.90 LITRE 8           CURB WT.      0 KG           GVM      0 KG

BAROMETER 738.63 MM OF HG.                                         WET BULB TEMP  16.7 DEG. C
DRY BULB TEMP.    24.4 DEG. C                                       ABS. HUMIDITY   8.8 GRAMS/KG
REL. HUMIDITY     45 PCT.                                           COMMENTS  1978 FTP EM 8

EXHAUST EMISSIONS                                                  BLOWER INLET PRESS., G1 655.3 MM. H2O
                                                                   BLOWER INLET TEMP.    41 DEG. C
   BLOWER DIF. PRESS., G2, 655.3 MM. H2O
   BAG RESULTS
   BAG NO.                                     1                2                3
   BLOWER REVOLUTIONS                        40794            70016            40793
   HC   SAMPLE  METER READING/SCALE          80.8/ 2          13.4/ 2          16.3/ 2
   HC   SAMPLE  PPM                          81               13               16
   HC   BACKGRD METER READING/SCALE          18.4/ 2          17.4/ 2          16.8/ 2
   HC   BACKGRD PPM                          18               17               17
   CO   SAMPLE  METER READING/SCALE          23.8/ 3          23.8/13          28.6/13
   CO   SAMPLE  PPM                          550              23               27
   CO   BACKGRD METER READING/SCALE          .1/ 3            5.0/13           3.7/13
   CO   BACKGRD PPM                          2                5                4
   CO2  SAMPLE  METER READING/SCALE          95.2/ 3          63.6/ 3          88.4/ 3
   CO2  SAMPLE  PERCENT                      1.79             1.13             1.64
   CO2  BACKGRD METER READING/SCALE          4.5/ 3           4.4/ 3           4.4/ 3
   CO2  BACKGRD PERCENT                      .07              .07              .07
   NOX  SAMPLE  METER READING/SCALE          17.2/ 2          7.0/ 2           36.3/ 2
   NOX  SAMPLE  PPM                          17.2             7.0              36.3
   NOX  BACKGRD METER READING/SCALE          1.3/ 2           1.0/ 2           1.0/ 2
   NOX  BACKGRD PPM                          1.3              1.0              1.0
   SO2  SAMPLE  METER READING/SCALE          -0.0/-0          -0.0/-0          -0.0/-0
   SO2  SAMPLE  PPM                          -0.0             -0.0             -0.0
   SO2  BACKGRD METER READING/SCALE          -0.0/-0          -0.0/-0          -0.0/-0
   SO2  BACKGRD PPM                          -0.0             -0.0             -0.0

   HC    CONCENTRATION PPM                   65               -3               2
   CO    CONCENTRATION PPM                   522              17               23
   CO2   CONCENTRATION PCT                   1.73             1.07             1.59
   NOX   CONCENTRATION PPM                   16.1             6.1              35.4
   SO2   CONCENTRATION PPM                   0.0              0.0              0.0
   HC    MASS GRAMS                          2.88             -.19             .07
   CO    MASS GRAMS                          46.74            2.67             2.03
   CO2   MASS GRAMS                        2435.19          2595.35          2234.39
   NOX   MASS GRAMS                          2.23             1.45             4.91
   SO2   MASS GRAMS                          0.00             0.00             0.00
   HC GRAMS/KM (GRAMS/MILE)                  .50 (   .80)     -.03 (  -.05)    .01 (   .02)
   CO GRAMS/KM (GRAMS/MILE)                 8.08 ( 13.00)     .42 (   .68)     .35 (   .56)
   CO2 GRAMS/KM (GRAMS/MILE)              421.01 (677.41)  412.49 (663.69)  384.88 (619.27)
   NOX GRAMS/KM (GRAMS/MILE)                 .39 (   .62)     .23 (   .37)     .85 (  1.36)
   FUEL CONSUMPTION BY CB  L/100KM (MPG)   18.58 ( 12.66)   17.63 ( 13.34)   16.45 ( 14.30)
   CVS FLOW STD. CU. METRES (SCF)           77.0 (2718.3)   132.1 (4665.1)    77.0 (2718.1)
   CALCULATED DISTANCE KM(MILES)            5.78 (  3.59)    6.29 (  3.91)    5.81 (  3.61)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)          17.50 ( 13.44)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                  .09 (   .14)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                 1.98 (  3.19)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)              406.69 (654.36)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)                 .43 (   .69)
    TOTAL CVS FLOW =    286.1 STD. CU. METRES
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                        TABLE                   VEHICLE EMISSION RESULTS
                                              1978  LIGHT DUTY EMISSIONS TEST
                                            ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  235      TEST NO.       1     DATE 12/29/77
VEHICLE MODEL  PLY FURY EM-R            ENGINE   5.90 LITRE 8          MFGR. CODE   -0                YR.  1977
                                                                       CURB WT.      0 KG             GVM      0 KG
BAROMETER 742.19 MM OF HG.
DRY BULB TEMP.   26.1 DEG. C                                      WET BULB TEMP  16.7 DEG. C
REL. HUMIDITY     37 PCT.                                          ABS. HUMIDITY   8.1 GRAMS/KG
                                                                   COMMENTS  1978 FTPC
EXHAUST EMISSIONS

    BLOWER DIF. PRESS., G2, 736.6 MM. H20                         BLOWER INLET PRESS., G1 736.6 MM. H20
    BAG RESULTS                                                   BLOWER INLET TEMP.    43 DEG. C
    BAG NO.
    BLOWER REVOLUTIONS                           1              2              3
    HC   SAMPLE  METER READING/SCALE           40460          69616          40572
    HC   SAMPLE  PPM                            12.2/ 3        20.5/ 2        37.4/ 2
    HC   BACKGRD METER READING/SCALE            122            20             37
    HC   BACKGRD PPM                            2.1/ 3        19.5/ 2        15.8/ 2
    CO   SAMPLE  METER READING/SCALE            21             19             16
    CO   SAMPLE  PPM                           94.1/11        18.3/13        63.3/13
    CO   BACKGRD METER READING/SCALE            482            17             61
    CO   BACKGRD PPM                            2.1/11         5.7/13         3.7/13
    CO2  SAMPLE  METER READING/SCALE             6              6              4
    CO2  SAMPLE  PERCENT                       42.8/ 2        68.4/ 3        89.0/ 3
    CO2  BACKGRD METER READING/SCALE           1.89           1.23           1.66
    CO2  BACKGRD PERCENT                        1.7/ 2         4.4/ 3         3.9/ 3
    NOX  SAMPLE  METER READING/SCALE            .06            .07            .06
    NOX  SAMPLE  PPM                           32.7/ 2         9.5/ 2        42.1/ 2
    NOX  BACKGRD METER READING/SCALE           32.7            9.5           42.1
    NOX  BACKGRD PPM                            1.3/ 2         1.0/ 2         1.0/ 2
    SO2  SAMPLE  METER READING/SCALE            1.3            1.0            1.0
    SO2  SAMPLE  PPM                          -0.0/-0        -0.0/-0        -0.0/-0
    SO2  BACKGRD METER READING/SCALE          -0.0           -0.0           -0.0
    SO2  BACKGRD PPM                          -0.0/-0        -0.0/-0        -0.0/-0
                                               -0.0           -0.0           -0.0
    HC   CONCENTRATION PPM
    CO   CONCENTRATION PPM                      104             3             24
    CO2  CONCENTRATION PCT                      453            12             55
    NOX  CONCENTRATION PPM                     1.83           1.17           1.60
    SO2  CONCENTRATION PPM                     31.6            8.6           41.2
    HC   MASS GRAMS                             0.0            0.0            0.0
    CO   MASS GRAMS                            4.54            .21           1.03
    CO2  MASS GRAMS                           39.87           1.79           4.89
    NOX  MASS GRAMS                         2538.98        2787.15        2227.75
    SO2  MASS GRAMS                            4.20           1.97           5.50
    HC GRAMS/KM (GRAMS/MILE)                   0.00           0.00           0.00
    CO GRAMS/KM (GRAMS/MILE)                    .78 (  1.26)    .03 (   .05)    .18 (   .28)
    CO2 GRAMS/KM (GRAMS/MILE)                  6.88 ( 11.06)    .29 (   .46)    .84 (  1.35)
    NOX GRAMS/KM (GRAMS/MILE)                437.91 (704.60) 445.16 (716.26) 382.24 (615.02)
    FUEL CONSUMPTION BY CB  L/100KM (MPG)       .72 (  1.17)    .31 (   .51)    .94 (  1.52)
    CVS FLOW STD. CU. METRES (SCF)            19.26 ( 12.22)  19.02 ( 12.37)  16.39 ( 14.35)
    CALCULATED DISTANCE KM(MILES)              75.6 (2669.6)  130.1 (4593.2)   75.8 (2677.2)
                                               5.80 (  3.60)   6.26 (  3.89)   5.83 (  3.62)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)            18.35 ( 12.82)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)              .23 (   .37)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)            1.80 (  2.90)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)          426.37 (686.03)
    TOTAL CVS FLOW =   281.5 STD. CU. METRES        .57 (   .92)
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     TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER   8

DATE 12/29/77               TIME    -0 HRS.         TEST NO.  2
MODEL  1977 PLY FURY EM-8   SET-7                   ENGINE 5.9 LITREV 8
DRIVER   AL                 TEST WT.  2041 KG.      GVW    0 KG
WET BULB TEMP  17 C         DRY BULB TEMP  25 C     REL. HUM.  45.7 PCT
SPEC. HUM.   9.2 GRAM/KG    BARO.  740.7 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION          23.28 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H2O
  BLOWER DIF.  PRESS. 736.6  MM  H2O
  BLOWER INLET TEMP.      42  DEG. C
  DYNO REVOLUTIONS     31835
  BLOWER REVOLUTIONS   112243
  BLOWER CU. CM /REV.  2226

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE           14.9/2
   HC  SAMPLE  PPM                             15
   HC  BACKGRD METER READING/SCALE           10.8/2
   HC  BACKGRD PPM                             11
   CO  SAMPLE  METER READING/SCALE           34.8/*
   CO  SAMPLE  PPM                             33
   CO  BACKGRD METER READING/SCALE            1.1/*
   CO  BACKGRD PPM                              1
   CO2 SAMPLE  METER READING/SCALE           43.4/2
   CO2 SAMPLE  PERCENT                       1.92
   CO2 BACKGRD METER READING/SCALE            1.7/2
   CO2 BACKGRD PERCENT                        .06
   NOX SAMPLE  METER READING/SCALE           38.4/2
   NOX SAMPLE  PPM                           38.4
   NOX BACKGRD METER READING/SCALE             .9/2
   NOX BACKGRD PPM                             .9
   HC  CONCENTRATION PPM                        6
   CO  CONCENTRATION PPM                       30
   CO2 CONCENTRATION PCT                     1.87
   NOX CONCENTRATION PPM                     37.6
   SO2 COCENTRATION PPM                      0.0
   HC  MASS (GRAMS)                           .68
   CO  MASS (GRAMS)                          7.39
   CO2 MASS (GRAMS)                       7187.70
   NOX MASS (GRAMS)                         14.38
   SO2 MASS (GRAMS)                          0.00

HC  GRAMS/KILOMETRE       .03
CO  GRAMS/KILOMETRE       .34
CO2 GRAMS/KILOMETRE    327
NOX GRAMS/KILOMETRE       .65
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL    .30     HC  GRAMS/MIN    .03
CO  GRAMS/KG OF FUEL    3.3     CO  GRAMS/MIN     .3
CO2 GRAMS/KG OF FUEL   3163     CO2 GRAMS/MIN    309
NOX GRAMS/KG OF FUEL   6.33     NOX GRAMS/MIN    .62
SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
CARBON BALANCE FUEL ECONOMY =   14.02 LITRES PER HUNDRED KILOMETERS
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER   8

DATE 12/29/77                TIME    -0 HRS.        TEST NO.  2
MODEL  1977 PLY FURY EM-8  SET-7                    ENGINE 5.9 LITREO
RUN DURATION   23.28 MIN.  DISTANCE DRIVEN  21.95 KILOMETRES
CVS BLOWER TEST VOL.  249.89 ACT. CU. METRES

                             SAMPLE                  BACKGROUND
SULFATE DATA                 ------                  ----------

 FILTER NO.               47-FH-2863
 SAMPLE VOL. CU. FT.         15.85                       1.00
 SAMPLE TEMP. DEG. F            78                         70
 SAMPLE AREA SQ. IN.      54952.00                       0.00
 DILUTION FACTOR                 1                          1
 STAND. DEN. MICROG/ML        5.00                       1.00
 STAND. AREA SQ. IN.     143626.00                       1.00
 SO4,MICROG/FILTER          19.130                      0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                       1.00
 SAMPLE TEMP. DEG. F            70                         70
 AREA,BUBBLER 1               0.00                       0.00
 DIL. FACT.,BUBBLER 1            1                          1
 AREA,BUBBLER 2               0.00                       0.00
 DIL. FACT.,BUBBLER 2            1                          1
 STAND. DEN. MICROG/ML        1.00                       1.00
 STAND. AREA,SQ. IN.          1.00                       1.00
 SO2, MILLIG/BUBBLER 1       0.000                      0.000
 SO2, MILLIG/BUBBLER 2       0.000                      0.000
 SO2, PPM                      0.0                        0.0

SULFATE AND SO2 EMISSIONS

 NFT SULFATE,MILLIGRAM/TEST            12.154
 NET H2SO4,MILLIGRAM/TEST              12.409
 NET SO2,GRAM/TEST                      0.000
 NET SULFATE,MILLIGRAM/KILOMETRE         .554
 NET H2SO4,MILLIGRAM/KILOMETRE           .565
 NET SO2,GRAM/KILOMETRE                 0.000

SULFUR BALANCE
 FUEL WT., 2272 GRAMS      SULFUR IN FUEL, .0320 PCT.
                           FUEL      SO2      H2SO4       SO2 + H2SO4
                           ----     -----    -------      -----------
          SULFUR,GRAMS      .73     0.000     .0041             .0041
          PCT. RECOVERY             0.00       .56               .56
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TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                        VEHICLE NUMBER 235

DATE 12/29/77               TIME     -0 HRS.        TEST NO.  3
MODEL  1970 PLY FURY EM-8   HFET                    ENGINES9.0 LITREV 8
DRIVER   AI                 TEST WT.  2041 KG.      GVW    0 KG
WET BULB TEMP  17 C         DRY BULB TEMP  26 C     REL. HUM.  40.6 PCT
SPEC. HUM. .  8.8 GRAM/KG   BARO.  740.2 MM  HG.    MEASURED FUEL  0.00 KG
DISTANCE  16.465 KM           FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

  RUN DURATION           12.76 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H2O
  BLOWER DIF.  PRESS. 736.6  MM  H2O
  BLOWER INLET TEMP.      43  DEG. C
  DYNO REVOLUTIONS    23929
  BLOWER REVOLUTIONS    61485
  BLOWER CU. CM /REV.  2228

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE            14.8/ 2
   HC  SAMPLE  PPM                              15
   HC  BACKGRD METER READING/SCALE            11.3/ 2
   HC  BACKGRD PPM                              11
   CO  SAMPLE  METER READING/SCALE            31.8/13
   CO  SAMPLE  PPM                              30
   CO  BACKGRD METER READING/SCALE              .9/13
   CO  BACKGRD PPM                               1
   CO2 SAMPLE  METER READING/SCALE            50.0/ 2
   CO2 SAMPLE  PERCENT                        2.28
   CO2 BACKGRD METER READING/SCALE             1.7/ 2
   CO2 BACKGRD PERCENT                         .06
   NOX SAMPLE  METER READING/SCALE            63.3/ 2
   NOX SAMPLE  PPM                            63.3
   NOX BACKGRD METER READING/SCALE             1.0/ 2
   NOX BACKGRD PPM                             1.0
   HC  CONCENTRATION PPM                         5
   CO  CONCENTRATION PPM                        28
   CO2 CONCENTRATION PCT                      2.23
   NOX CONCENTRATION PPM                      62.5
   SO2 COCENTRATION PPM                        0.0
   HC  MASS (GRAMS)                            .36
   CO  MASS (GRAMS)                           3.69
   CO2 MASS (GRAMS)                        4679.29
   NOX MASS (GRAMS)                          12.86
   SO2 MASS (GRAMS)                           0.00

HC  GRAMS/KM (GRAMS/MILE)        .02 (   .04)
CO  GRAMS/KM (GRAMS/MILE)        .22 (   .36)
CO2 GRAMS/KM (GRAMS/MILE)        284 (   457)
NOX GRAMS/KM (GRAMS/MILE)        .78 (  1.26)
SO2 GRAMS/KM (GRAMS/MILE)       0.00 (  0.00)

HC  GRAMS/KG OF FUEL     .24     HC  GRAMS/MIN    .03
CO  GRAMS/KG OF FUEL     2.5     CO  GRAMS/MIN     .3
CO2 GRAMS/KG OF FUEL    3165     CO2 GRAMS/MIN    367
NOX GRAMS/KG OF FUEL    8.70     NOX GRAMS/MIN   1.01
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN   0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      12.15 ( 19.37)

TOTAL CVS FLOW=   114.6STD. CU. METRES
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                       TABLE                   VEHICLE EMISSION RESULTS
                                             1978  LIGHT DUTY EMISSIONS TEST
                                          ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM8      TEST NO.      1       DATE  1/ 3/78                      MFGR. CODE    -0                 YR.  1977
VEHICLE MODEL  FURY PLY                  ENGINE   5.90 LITRE 8              CURB WT.      0 KG               GVM      0 KG

BAROMETER 750.82 MM OF HG.                                                WET BULB TEMP  10.6 DEG. C
DRY BULB TEMP.    21.1 DEG. C                                              ABS. HUMIDITY   3.5 GRAMS/KG
REL. HUMIDITY      23 PCT.                                                 COMMENTS  1978 FTP-C

EXHAUST EMISSIONS

                                                                          BLOWER INLET PRESS., G1 736.6 MM. H2O
   BLOWER DIF. PRESS., G2, 736.6 MM. H2O                                  BLOWER INLET TEMP.    42 DEG. C
   BAG RESULTS
   BAG NO.                                       1                 2                 3
   BLOWER REVOLUTIONS                          40558             69651             40548
   HC    SAMPLE  METER READING/SCALE            12.5/ 3           10.6/ 2           15.5/ 2
   HC    SAMPLE  PPM                            125               11                15
   HC    BACKGRD METER READING/SCALE             8.5/ 2            .9/ 3             8.1/ 2
   HC    BACKGRD PPM                              9                 9                 8
   CO    SAMPLE  METER READING/SCALE            96.1/11           22.0/13           36.1/13
   CO    SAMPLE  PPM                            501               21                34
   CO    BACKGRD METER READING/SCALE             2.6/11            2.0/11            5.3/13
   CO    BACKGRD PPM                              8                 6                 5
   CO2   SAMPLE  METER READING/SCALE            97.4/ 3           68.2/ 3           86.4/ 3
   CO2   SAMPLE  PERCENT                        1.83              1.23              1.60
   CO2   BACKGRD METER READING/SCALE             4.5/ 3            4.8/ 3            4.2/ 3
   CO2   BACKGRD PERCENT                         .07               .07               .06
   NOX   SAMPLE  METER READING/SCALE            37.8/ 2           11.5/ 2           48.1/ 2
   NOX   SAMPLE  PPM                            37.8              11.5              48.1
   NOX   BACKGRD METER READING/SCALE              .8/ 2             .7/ 2             .7/ 2
   NOX   BACKGRD PPM                              .8                .7                .7
   SO2   SAMPLE  METER READING/SCALE           -0.0/-0           -0.0/-0           -0.0/-0
   SO2   SAMPLE  PPM                           -0.0              -0.0              -0.0
   SO2   BACKGRD METER READING/SCALE           -0.0/-0           -0.0/-0           -0.0/-0
   SO2   BACKGRD PPM                           -0.0              -0.0              -0.0

   HC    CONCENTRATION PPM                      118                2                 8
   CO    CONCENTRATION PPM                      472               15                28
   CO2   CONCENTRATION PCT                      1.77              1.16              1.55
   NOX   CONCENTRATION PPM                      37.1              10.9              47.5
   SO2   CONCENTRATION PPM                      0.0               0.0               0.0
   HC    MASS GRAMS                             5.22               .18               .37
   CO    MASS GRAMS                            42.26              2.27              2.53
   CO2   MASS GRAMS                          2496.37           2803.85           2174.63
   NOX   MASS GRAMS                             4.41              2.22              5.64
   SO2   MASS GRAMS                             0.00              0.00              0.00
   HC GRAMS/KM (GRAMS/MILE)                    .90 (  1.45)      .03 (   .05)      .06 (   .10)
   CO GRAMS/KM (GRAMS/MILE)                   7.30 ( 11.75)      .36 (   .58)      .44 (   .70)
   CO2 GRAMS/KM (GRAMS/MILE)                431.23 (693.85)   444.02 (714.43)   374.85 (603.13)
   NOX GRAMS/KM (GRAMS/MILE)                   .76 (  1.23)      .35 (   .57)      .97 (  1.57)
   FUEL CONSUMPTION BY CB  L/100KM (MPG)     19.02 ( 12.37)    18.98 ( 12.39)    16.04 ( 14.67)
   CVS FLOW STD. CU. METRES (SCF)             76.8 (2713.5)    131.9 (4659.5)     76.8 (2712.6)
   CALCULATED DISTANCE KM(MILES)              5.79 (  3.60)     6.31 (  3.92)     5.80 (  3.61)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)          18.18 ( 12.94)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                  .22 (   .35)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                 1.81 (  2.91)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)              422.51 (679.82)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)                 .61 (   .97)
    TOTAL CVS FLOW =   285.6 STD. CU. METRES
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                                VEHICLE NUMBER   8

DATE  1/ 3/78               TIME    -0 HRS.          TEST NO.  2
MODEL  1977 FURY PLY        SET-7                    ENGINE 5.9 LITREV 8
DRIVER   SR                 TEST WT.  2041 KG.       GVW    0 KG
WET BULB TEMP  12 C         DRY BULB TEMP  24 C      REL. HUM.  19.7 PCT
SPFC. HUM.  3.8 GRAM/KG     BARO.  751.3 MM  HG.     MEASURED FUEL  0.00 KG

  RUN DURATION           23.29 MINUTES
  BLOWER INLET PRESS. 711.2  MM. H2O
  BLOWER DIF.  PRESS. 711.2  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    31639
  BLOWER REVOLUTIONS   112257
  BLOWER CU. CM /REV.  2231

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE           12.0/2
   HC  SAMPLE  PPM                             12
   HC  BACKGRD METER READING/SCALE            8.1/2
   HC  BACKGRD PPM                              8
   CO  SAMPLE  METER READING/SCALE           29.8/*
   CO  SAMPLE  PPM                             28
   CO  BACKGRD METER READING/SCALE            2.1/*
   CO  BACKGRD PPM                              2
   CO2 SAMPLE  METER READING/SCALE           44.0/2
   CO2 SAMPLE  PERCENT                       1.95
   CO2 BACKGRD METER READING/SCALE            2.1/2
   CO2 BACKGRD PERCENT                        .08
   NOX SAMPLE  METER READING/SCALE           54.0/2
   NOX SAMPLE  PPM                           54.0
   NOX BACKGRD METER READING/SCALE             .6/2
   NOX BACKGRD PPM                             .6
   HC  CONCENTRATION PPM                        5
   CO  CONCENTRATION PPM                       25
   CO2 CONCENTRATION PCT                     1.89
   NOX CONCENTRATION PPM                     53.5
   SO2 COCENTRATION PPM                      0.0
   HC  MASS (GRAMS)                           .63
   CO  MASS (GRAMS)                          6.27
   CO2 MASS (GRAMS)                        7400.57
   NOX MASS (GRAMS)                         17.77
   SO2 MASS (GRAMS)                          0.00

HC  GRAMS/KILOMETRE       .03
CO  GRAMS/KILOMETRE       .29
CO2 GRAMS/KILOMETRE    339
NOX GRAMS/KILOMETRE       .81
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL     .27     HC  GRAMS/MIN     .03
CO  GRAMS/KG OF FUEL     2.7     CO  GRAMS/MIN      .3
CO2 GRAMS/KG OF FUEL    3164     CO2 GRAMS/MIN    318
NOX GRAMS/KG OF FUEL    7.60     NOX GRAMS/MIN     .76
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =   14.52 LITRES PER HUNDRED KILOMETERS
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TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                     VEHICLE NUMBER   8

DATE  1/ 3/78              TIME    -0 HRS.        TEST NO.  2
MODEL  1977 FURY PLY       SET-7                  ENGINE 5.9 LITRED
RUN DURATION   23.29 MIN.  DISTANCE DRIVEN  21.81 KILOMETRES
CVS BLOWER TEST VOL.  250.45 ACT. CU. METRES

                           SAMPLE                 BACKGROUND
SULFATE DATA               ------                 ----------

 FILTER NO.              47-FH-2865
 SAMPLE VOL. CU. FT.        15.84                    1.00
 SAMPLE TEMP. DEG. F          78                       70
 SAMPLE AREA SQ. IN.     74835.00                    0.00
 DILUTION FACTOR               1                        1
 STAND. DEN. MICROG/ML      5.00                     1.00
 STAND. AREA SQ. IN.    146996.00                    1.00
 SO4,MICROG/FILTER         25.455                   0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.        1.00                     1.00
 SAMPLE TEMP. DEG. F          70                       70
 AREA,BUBBLER 1             0.00                     0.00
 DIL. FACT.,BUBBLER 1          1                        1
 AREA,BUBBLER 2             0.00                     0.00
 DIL. FACT.,BUBBLER 2          1                        1
 STAND. DEN. MICROG/ML      1.00                     1.00
 STAND. AREA,SQ. IN.        1.00                     1.00
 SO2, MILLIG/BUBBLER 1     0.000                    0.000
 SO2, MILLIG/BUBBLER 2     0.000                    0.000
 SO2, PPM                    0.0                      0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST             16.190
 NET H2SO4,MILLIGRAM/TEST               16.530
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE          .742
 NET H2SO4,MILLIGRAM/KILOMETRE            .758
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2339 GRAMS     SULFUR IN FUEL, .0320 PCT.
                            FUEL     SO2       H2SO4      SO2 + H2SO4
                            ----    -----     -------    -----------
           SULFUR,GRAMS      .75    0.000      .0054         .0054
           PCT. RECOVERY             0.00        .72           .72
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     TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                         VEHICLE NUMBER   8

DATE  1/ 3/78              TIME    -0 HRS.         TEST NO.  3
MODEL  1977 FURY PLY       FET                     ENGINE 5.9 LITREV 8
DRIVER   SR                TEST WT.  2041 KG.      GVW    0 KG
WET BULB TEMP  12 C        DRY BULB TEMP  24 C     REL. HUM.  19.7 PCT
SPEC. HUM.   3.8 GRAM/KG   BARO.  751.3 MM  HG.    MEASURED FUEL  0.00 KG

 RUN DURATION          12.76 MINUTES
 BLOWER INLET PRESS. 711.2  MM. H2O
 BLOWER DIF.  PRESS. 711.2  MM  H2O
 BLOWER INLET TEMP.     42  DEG. C
 DYNO REVOLUTIONS    23921
 BLOWER REVOLUTIONS    61553
 BLOWER CU. CM /REV.  2228

 BAG RESULTS
  HC  SAMPLE  METER RFADING/SCALE              12.1/2
  HC  SAMPLE  PPM                                 12
  HC  BACKGRD METER READING/SCALE               8.2/2
  HC  BACKGRD PPM                                  8
  CO  SAMPLE  METER READING/SCALE              17.1/*
  CO  SAMPLE  PPM                                 16
  CO  BACKGRD METER READING/SCALE               1.6/*
  CO  BACKGRD PPM                                  2
  CO2 SAMPLE  METER READING/SCALE              48.9/2
  CO2 SAMPLE  PERCENT                          2.22
  CO2 BACKGRD METER READING/SCALE               1.7/2
  CO2 BACKGRD PERCENT                           .06
  NOX SAMPLE  METER READING/SCALE              77.4/2
  NOX SAMPLF  PPM                              77.4
  NOX BACKGRD METER READING/SCALE                .5/2
  NOX BACKGRD PPM                                .5
  HC  CONCENTRATION PPM                           5
  CO  CONCENTRATION PPM                          14
  CO2 CONCENTRATION PCT                        2.17
  NOX CONCENTRATION PPM                        77.0
  SO2 COCENTRATION PPM                         0.0
  HC  MASS (GRAMS)                              .36
  CO  MASS (GRAMS)                             1.94
  CO2 MASS (GRAMS)                          4676.12
  NOX MASS (GRAMS)                            14.05
  SO2 MASS (GRAMS)                             0.00

HC  GRAMS/KILOMETRE       .02
CO  GRAMS/KILOMETRE       .12
CO2 GRAMS/KILOMETRE    284
NOX GRAMS/KILOMETRE       .85
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL     .24     HC  GRAMS/MIN     .03
CO  GRAMS/KG OF FUEL     1.3     CO  GRAMS/MIN      .2
CO2 GRAMS/KG OF FUEL    3167     CO2 GRAMS/MIN     367
NOX GRAMS/KG OF FUEL    9.51     NOX GRAMS/MIN    1.10
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =   12.14 LITRES PER HUNDRED KILOMETERS
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                     TABLE                    VEHICLE EMISSION RESULTS
                                        1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  EMB        TEST NO. 1        DATE  1/24/78               MFGR. CODE    -0                  YR.   1977
VEHICLE MODEL   FURY PLYMOUTH          ENGINE   5.90 LITRE 8       CURB WT.      0 KG                GVM      0 KG

BAROMETER 737.11 MM OF HG.                                      WET BULB TEMP  14.4 DEG. C
DRY BULB TEMP.    22.2 DEG. C                                    ABS. HUMIDITY   7.2 GRAMS/KG
REL. HUMIDITY      42 PCT.

EXHAUST EMISSIONS                                               BLOWER INLET PRESS., G1 736.6 MM. H2O
   BLOWER DIF. PRESS., G2, 736.6 MM. H2O                        BLOWER INLET TEMP.    43 DEG. C
   BAG RESULTS
   BAG NO.                                     1             2              3
   BLOWER REVOLUTIONS                      42508         71883          40910
   HC    SAMPLE  METER READING/SCALE        85.9/2        11.2/2         14.6/2
   HC    SAMPLE  PPM                        86            11             15
   HC    BACKGRD METER READING/SCALE         8.7/2         8.1/2          8.2/2
   HC    BACKGRD PPM                         9             8              8
   CO    SAMPLE  METER READING/SCALE        93.9/*        26.3/*         66.2/*
   CO    SAMPLE  PPM                       480            25             64
   CO    BACKGRD METER READING/SCALE         1.4/*         1.7/*          3.1/*
   CO    BACKGRD PPM                         4             2              3
   CO2   SAMPLE  METER READING/SCALE        98.4/3        68.4/3         89.3/3
   CO2   SAMPLE  PERCENT                     1.85          1.23           1.66
   CO2   BACKGRD METER READING/SCALE         4.5/3         2.9/3          3.4/3
   CO2   BACKGRD PERCENT                      .07           .04            .05
   NOX   SAMPLE  METER READING/SCALE        44.7/2        17.3/2         54.0/2
   NOX   SAMPLE  PPM                        44.7          17.3           54.0
   NOX   BACKGRD METER READING/SCALE          .9/2         1.0/2           .9/2
   NOX   BACKGRD PPM                          .9           1.0             .9
   SO2   SAMPLE  METER READING/SCALE        -0.0/*        -0.0/*         -0.0/*
   SO2   SAMPLE  PPM                        -0.0          -0.0           -0.0
   SO2   BACKGRD METER READING/SCALE        -0.0/*        -0.0/*         -0.0/*
   SO2   BACKGRD PPM                        -0.0          -0.0           -0.0

   HC    CONCENTRATION PPM                  78             4              7
   CO    CONCENTRATION PPM                 453            22             59
   CO2   CONCENTRATION PCT                   1.80          1.19           1.62
   NOX   CONCENTRATION PPM                  43.9          16.4           53.2
   SO2   CONCENTRATION PPM                   0.0           0.0            0.0
   HC    MASS GRAMS                          3.57           .30            .32
   CO    MASS GRAMS                         41.59          3.49           5.18
   CO2   MASS GRAMS                       2606.28       2922.13        2255.81
   NOX   MASS GRAMS                          5.95          3.75           6.92
   SO2   MASS GRAMS                          0.00          0.00           0.00

   WEIGHTED MASS HC        .17 GRAMS/KILOMETRE
   WEIGHTED MASS CO       2.02 GRAMS/KILOMETRE
   WEIGHTED MASS CO2    441.57 GRAMS/KILOMETRE
   WEIGHTED MASS NOX       .85 GRAMS/KILOMETRE
   WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

   FUEL ECONOMY BY CARBON BALANCE =   5.3  KILOMETRE/LITRE
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                        TABLE                    VEHICLE EMISSION RESULTS
                                              1978  LIGHT DUTY EMISSIONS TEST
                                            ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM8      TEST NO.      1      DATE  1/26/78                MFGR. CODE    -0                    YR.  1977
VEHICLE MODEL  PLY FURY EM 8            ENGINE   5.90 LITRE 8        CURB WT.      0 KG                  GVM     0 KG

BAROMETER 748.03 MM OF HG.                                         WET BULB TEMP  11.1 DEG. C
DRY BULB TEMP.   23.9 DEG. C                                        ABS. HUMIDITY   2.9 GRAMS/KG
REL. HUMIDITY     16 PCT.                                           COMMENTS  1978 FTPC

EXHAUST EMISSIONS
                                                                   BLOWER INLET PRESS., G1 736.6 MM. H20
   BLOWER DIF. PRESS., G2, 736.6 MM. H20                           BLOWER INLET TEMP.    43 DEG. C
   BAG RESULTS
   BAG NO.                                     1               2               3
   BLOWER REVOLUTIONS                        40671           69714           40596
   HC    SAMPLE  METER READING/SCALE          71.8/ 2         11.4/ 2         16.9/ 2
   HC    SAMPLE  PPM                          72              11              17
   HC    BACKGRD METER READING/SCALE          10.3/ 2          8.3/ 2          9.3/ 2
   HC    BACKGRD PPM                          10               8               9
   CO    SAMPLE  METER READING/SCALE          73.9/11         26.6/13         70.1/13
   CO    SAMPLE  PPM                          324             25              68
   CO    BACKGRD METER READING/SCALE           .7/11          1.7/13          1.5/13
   CO    BACKGRD PPM                           2               2               1
   CO2   SAMPLE  METER READING/SCALE          42.2/ 2         68.3/ 3         87.6/ 3
   CO2   SAMPLE  PERCENT                      1.85            1.23            1.63
   CO2   BACKGRD METER READING/SCALE           1.3/ 2          3.5/ 3          4.0/ 3
   CO2   BACKGRD PERCENT                       .05             .05             .06
   NOX   SAMPLE  METER READING/SCALE          47.8/ 2         18.5/ 2         58.5/ 2
   NOX   SAMPLE  PPM                          47.8            18.5            58.5
   NOX   BACKGRD METER READING/SCALE           .6/ 2           .4/ 2           .7/ 2
   NOX   BACKGRD PPM                           .6              .4              .7
   SO2   SAMPLE  METER READING/SCALE         -0.0/-0         -0.0/-0         -0.0/-0
   SO2   SAMPLE  PPM                         -0.0            -0.0            -0.0
   SO2   BACKGRD METER READING/SCALE         -0.0/-0         -0.0/-0         -0.0/-0
   SO2   BACKGRD PPM                         -0.0            -0.0            -0.0

   HC    CONCENTRATION PPM                    63               4               9
   CO    CONCENTRATION PPM                    309             23              65
   CO2   CONCENTRATION PCT                    1.81            1.18            1.57
   NOX   CONCENTRATION PPM                    47.3            18.1            57.9
   SO2   CONCENTRATION PPM                    0.0             0.0             0.0
   HC    MASS GRAMS                           2.78             .29             .39
   CO    MASS GRAMS                          27.55            3.51            5.76
   CO2   MASS GRAMS                        2547.23         2841.19         2205.23
   NOX   MASS GRAMS                           5.52            3.63            6.75
   SO2   MASS GRAMS                           0.00            0.00            0.00
   HC GRAMS/KM (GRAMS/MILE)                  .47 (   .76)    .05 (   .07)    .07 (   .11)
   CO GRAMS/KM (GRAMS/MILE)                 4.68 (  7.53)    .55 (   .88)    .98 (  1.58)
   CO2 GRAMS/KM (GRAMS/MILE)              432.71 (696.23)  442.37 (711.77)  375.93 (604.87)
   NOX GRAMS/KM (GRAMS/MILE)                 .94 (  1.51)    .57 (   .91)   1.15 (  1.85)
   FUEL CONSUMPTION BY CB  L/100KM (MPG)   18.85 ( 12.48)  18.92 ( 12.43)  16.12 ( 14.59)
   CVS FLOW STD. CU. METRES (SCF)           76.7 (2707.2)  131.4 (4640.0)   76.5 (2702.0)
   CALCULATED DISTANCE KM(MILES)            5.89 (  3.66)   6.42 (  3.99)   5.87 (  3.65)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)          18.14 ( 12.96)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                  .14 (   .22)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                 1.52 (  2.44)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)              422.30 (679.49)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)                 .80 (  1.29)
    TOTAL CVS FLOW =   284.6 STD. CU. METRES
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                     TABLE                   VEHICLE EMISSION RESULTS
                                          1978  LIGHT DUTY EMISSIONS TEST
                                        ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO. EMB      TEST NO.      1       DATE  2/ 3/78                    MFGR. CODE   -0                   YR.  1977
VEHICLE MODEL  FURY PLY                 ENGINE   5.90 LITRE 8            CURB WT.      0 KG                GVM      0 KG

BAROMETER 743.46 MM OF HG.                                            WET BULB TEMP  13.3 DEG. C
DRY BULB TEMP.   23.3 DEG. C                                           ABS. HUMIDITY   5.5 GRAMS/KG
REL. HUMIDITY     30 PCT.                                              COMMENTS  1978 FTP-C

EXHAUST EMISSIONS                                                     BLOWER INLET PRESS., G1 736.6 MM, H2O
   BLOWER DIF. PRESS., G2, 736.6 MM, H2O                              BLOWER INLET TEMP.   43 DEG. C
   BAG RESULTS
   BAG NO.                                        1                  2                  3
   BLOWER REVOLUTIONS                         40680              69703              40569
   HC    SAMPLE  METER READING/SCALE          85,8/ 2            12,6/ 2            21,4/ 2
   HC    SAMPLE  PPM                          86                 13                 21
   HC    BACKGRD METER READING/SCALE           9,9/ 2            10,2/ 2            11,7/ 2
   HC    BACKGRD PPM                          10                 10                 12
   CO    SAMPLE  METER READING/SCALE          97,5/11            43,4/13            55,7/12
   CO    SAMPLE  PPM                          514                41                 124
   CO    BACKGRD METER READING/SCALE           1,0/11             2,5/13             1,0/12
   CO    BACKGRD PPM                           3                  2                  2
   CO2   SAMPLE  METER READING/SCALE          91,2/ 3            66,1/ 3            89,6/ 3
   CO2   SAMPLE  PERCENT                      1,70               1,19               1,59
   CO2   BACKGRD METER READING/SCALE           4,5/ 3             4,1/ 3             4,2/ 3
   CO2   BACKGRD PERCENT                      ,07                ,06                ,06
   NOX   SAMPLE  METER READING/SCALE          37,1/ 2            12,1/ 2            45,6/ 2
   NOX   SAMPLE  PPM                          37,1               12,1               45,6
   NOX   BACKGRD METER READING/SCALE            ,7/ 2              ,8/ 2              ,9/ 2
   NOX   BACKGRD PPM                            ,7                 ,8                 ,9
   SO2   SAMPLE  METER READING/SCALE          -0,0/-0            -0,0/-0            -0,0/-0
   SO2   SAMPLE  PPM                          -0,0               -0,0               -0,0
   SO2   BACKGRD METER READING/SCALE          -0,0/-0            -0,0/-0            -0,0/-0
   SO2   BACKGRD PPM                          -0,0               -0,0               -0,0

   HC    CONCENTRATION PPM                    77                  3                 11
   CO    CONCENTRATION PPM                    490                38                 117
   CO2   CONCENTRATION PCT                    1,64               1,13               1,53
   NOX   CONCENTRATION PPM                    36,5               11,4               44,8
   SO2   CONCENTRATION PPM                    0,0                0,0                0,0
   HC    MASS GRAMS                           3,39               ,25                ,49
   CO    MASS GRAMS                           43,42              5,71               10,37
   CO2   MASS GRAMS                         2291,91            2694,55            2126,81
   NOX   MASS GRAMS                           4,53               2,42               5,55
   SO2   MASS GRAMS                           0,00               0,00               0,00
   HC GRAMS/KM (GRAMS/MILE)                    ,58 (   ,93)       ,04 (   ,06)       ,08 (   ,13)
   CO GRAMS/KM (GRAMS/MILE)                   7,44 ( 11,97)       ,90 (  1,46)      1,78 (  2,86)
   CO2 GRAMS/KM (GRAMS/MILE)                392,64 (631,76)   426,76 (686,66)   364,32 (586,18)
   NOX GRAMS/KM (GRAMS/MILE)                   ,78 (  1,25)       ,38 (   ,62)       ,95 (  1,53)
   FUEL CONSUMPTION BY CB  L/100KM (MPG)     17,34 ( 13,57)     18,28 ( 12,87)     15,68 ( 15,00)
   CVS FLOW STD. CU. METRES (SCF)             76,2 (2689,8)     130,5 (4608,0)      75,9 (2682,0)
   CALCULATED DISTANCE KM(MILES)              5,84 (  3,63)      6,31 (  3,92)      5,84 (  3,63)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)          17,37 ( 13,54)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                  ,16 (   ,26)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                 2,49 (  4,01)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)              402,61 (647,80)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)                 ,62 (  1,00)
   TOTAL CVS FLOW =   282.6 STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER EMB

DATE  2/ 3/78               TIME     -0 HRS.         TEST NO.  2
MODEL  1977 FURY PLY        SET-7                    ENGINE 5.9 LITREV 8
DRIVER   BP                 TEST WT.  2041 KG.       GVW    0 KG
WET BULB TEMP  13 C         DRY BULB TEMP  24 C      REL. HUM.  22.7 PCT
SPEC. HUM.   4.4 GRAM/KG    BARO.  748.5 MM  HG.     MEASURED FUEL  0.00 KG
DISTANCE  21.837 KM           FUEL 738.2 G/LITRE     FUEL HC  RATIO 1.860

  RUN DURATION          23.28 MINUTES
  BLOWER INLET PRESS. 762.0  MM. H2O
  BLOWER DIF.  PRESS. 762.0  MM  H2O
  BLOWER INLET TEMP.      43  DEG. C
  DYNO REVOLUTIONS     31735
  BLOWER REVOLUTIONS   112176
  BLOWER CU. CM /REV.  2226

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE            18.6/ 2
   HC  SAMPLE  PPM                               19
   HC  BACKGRD METER READING/SCALE            16.6/ 2
   HC  BACKGRD PPM                               17
   CO  SAMPLE  METER READING/SCALE            67.8/13
   CO  SAMPLE  PPM                               66
   CO  BACKGRD METER READING/SCALE             2.5/13
   CO  BACKGRD PPM                                2
   CO2 SAMPLE  METER READING/SCALE            41.9/ 2
   CO2 SAMPLE  PERCENT                        1.84
   CO2 BACKGRD METER READING/SCALE             2.2/ 2
   CO2 BACKGRD PERCENT                         .08
   NOX SAMPLE  METER READING/SCALE            51.5/ 2
   NOX SAMPLE  PPM                            51.5
   NOX BACKGRD METER READING/SCALE             1.7/ 2
   NOX BACKGRD PPM                             1.7
   HC  CONCENTRATION PPM                         4
   CO  CONCENTRATION PPM                        61
   CO2 CONCENTRATION PCT                      1.77
   NOX CONCENTRATION PPM                      50.0
   SO2 COCENTRATION PPM                        0.0
   HC  MASS (GRAMS)                            .52
   CO  MASS (GRAMS)                          14.99
   CO2 MASS (GRAMS)                        6833.46
   NOX MASS (GRAMS)                          16.69
   SO2 MASS (GRAMS)                           0.00

HC  GRAMS/KM (GRAMS/MILE)         .02 (   .04)
CO  GRAMS/KM (GRAMS/MILE)         .69 (  1.10)
CO2 GRAMS/KM (GRAMS/MILE)         313 (   504)
NOX GRAMS/KM (GRAMS/MILE)         .76 (  1.23)
SO2 GRAMS/KM (GRAMS/MILE)        0.00 (  0.00)

HC  GRAMS/KG OF FUEL     .24     HC  GRAMS/MIN    .02
CO  GRAMS/KG OF FUEL     6.9     CO  GRAMS/MIN     .6
CO2 GRAMS/KG OF FUEL    3158     CO2 GRAMS/MIN    294
NOX GRAMS/KG OF FUEL    7.71     NOX GRAMS/MIN    .72
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN   0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      13.41 ( 17.55)

TOTAL CVS FLOW=   210.9STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER EM8

DATE  2/ 3/78                  TIME     -0 HRS.        TEST NO.  2
MODEL  1977 FURY PLY           SET-7                   ENGINE 5.9 LITREO
RUN DURATION   23.28 MIN.  DISTANCE DRIVEN  21.88 KILOMETRES
CVS BLOWER TEST VOL.  249.75 ACT. CU. METRES

                               SAMPLE                  BACKGROUND
SULFATE DATA                   ------                  ----------

 FILTER NO.                 47FH-2881
 SAMPLE VOL. CU. FT.           16.00                      1.00
 SAMPLE TEMP. DEG. F             79                         70
 SAMPLE AREA SQ. IN.        48388.00                      0.00
 DILUTION FACTOR                  1                          1
 STAND. DEN. MICROG/ML          5.00                      1.00
 STAND. AREA SQ. IN.       143478.00                      1.00
 SO4,MICROG/FILTER            16.863                     0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.            1.00                      1.00
 SAMPLE TEMP. DEG. F              70                        70
 AREA,BUBBLER 1                 0.00                      0.00
 DIL. FACT.,BUBBLER 1             1                          1
 AREA,BUBBLER 2                 0.00                      0.00
 DIL. FACT.,BUBBLER 2             1                          1
 STAND. DEN. MICROG/ML          1.00                      1.00
 STAND. AREA,SQ. IN.            1.00                      1.00
 SO2, MILLIG/BUBBLER 1         0.000                     0.000
 SO2, MILLIG/BUBBLER 2         0.000                     0.000
 SO2, PPM                        0.0                       0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST              10.628
 NET H2SO4,MILLIGRAM/TEST                10.851
 NET SO2,GRAM/TEST                        0.000
 NET SULFATE,MILLIGRAM/KILOMETRE           .486
 NET H2SO4,MILLIGRAM/KILOMETRE             .496
 NET SO2,GRAM/KILOMETRE                   0.000

SULFUR BALANCE
 FUEL WT., 2173 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL     SO2       H2SO4        SO2 + H2SO4
                            ----    -----     -------      -----------
            SULFUR,GRAMS     .67    0.000      .0035             .0035
            PCT. RECOVERY           0.00        .53               .53
      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER EM8

DATE  2/ 3/78               TIME     -0 HRS.         TEST NO.  3
MODEL  1977 FURY PLYMOUTH   FET                      ENGINE 5.9 LITREV 8
DRIVER   BP                 TEST WT.  2041 KG.       GVW    0 KG
WET BULB TEMP  11 C         DRY BULB TEMP  20 C      REL. HUM.  27.6 PCT
SPEC. HUM.   4.0 GRAM/KG    BARO.  748.5 MM  HG.     MEASURED FUEL  0.00 KG
DISTANCE  16.491 KM            FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

  RUN DURATION          12.75 MINUTES
  BLOWER INLET PRESS. 762.0  MM. H2O
  BLOWER DIF.  PRESS. 762.0  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    23966
  BLOWER REVOLUTIONS    61454
  BLOWER CU. CM /REV.  2226

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE            16.0/ 2
   HC  SAMPLE  PPM                              16
   HC  BACKGRD METER READING/SCALE            13.8/ 2
   HC  BACKGRD PPM                              14
   CO  SAMPLE  METER READING/SCALE            51.2/13
   CO  SAMPLE  PPM                              49
   CO  BACKGRD METER READING/SCALE             2.7/13
   CO  BACKGRD PPM                               3
   CO2 SAMPLE  METER READING/SCALE            48.5/ 2
   CO2 SAMPLE  PERCENT                        2.20
   CO2 BACKGRD METER READING/SCALE             2.2/ 2
   CO2 BACKGRD PERCENT                         .08
   NOX SAMPLE  METER READING/SCALE            75.9/ 2
   NOX SAMPLE  PPM                            75.9
   NOX BACKGRD METER READING/SCALE             2.1/ 2
   NOX BACKGRD PPM                             2.1
   HC  CONCENTRATION PPM                         4
   CO  CONCENTRATION PPM                        44
   CO2 CONCENTRATION PCT                      2.13
   NOX CONCENTRATION PPM                      74.1
   SO2 COCENTRATION PPM                       0.0
   HC  MASS (GRAMS)                            .30
   CO  MASS (GRAMS)                           5.94
   CO2 MASS (GRAMS)                        4506.72
   NOX MASS (GRAMS)                          13.43
   SO2 MASS (GRAMS)                           0.00

HC  GRAMS/KM (GRAMS/MILE)         .02 (    .03)
CO  GRAMS/KM (GRAMS/MILE)         .36 (    .58)
CO2 GRAMS/KM (GRAMS/MILE)        273 (    440)
NOX GRAMS/KM (GRAMS/MILE)         .81 (   1.31)
SO2 GRAMS/KM (GRAMS/MILE)        0.00 (   0.00)

HC  GRAMS/KG OF FUEL     .21     HC  GRAMS/MIN    .02
CO  GRAMS/KG OF FUEL     4.2     CO  GRAMS/MIN     .5
CO2 GRAMS/KG OF FUEL    3162     CO2 GRAMS/MIN    353
NOX GRAMS/KG OF FUEL    9.42     NOX GRAMS/MIN   1.05
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN   0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      11.69 ( 20.12)

TOTAL CVS FLOW=   115.6STD. CU. METRES
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                         TABLE                    VEHICLE EMISSION RESULTS
                                             1975  LIGHT DUTY EMISSIONS TEST
                                                                MFGR. CODE    -0                 YR.  1977
UNIT NO.  EMR         TEST NO. 1           DATE  2/ 6/78                                          GVM      0 KG
VEHICLE MODEL  FURY PLYMOUTH               ENGINE   5.90 LITRE 8         CURB WT.      0 KG

BAROMETER 747.52 MM OF HG.                                          WET BULB TEMP  12.2 DEG. C
DRY BULB TEMP.    25.0 DEG. C                                        ABS. HUMIDITY   3.6 GRAMS/KG
REL. HUMIDITY      18 PCT.

EXHAUST EMISSIONS                                                   BLOWER INLET PRESS., G1 749.3 MM. H2O
                                                                    BLOWER INLET TEMP.   44 DEG. C
    BLOWER DIF. PRESS., G2, 749.3 MM. H2O
    BAG RESULTS
    BAG NO.                                      1               2               3
    BLOWER REVOLUTIONS                       40531           69560           40632
    HC   SAMPLE  METER READING/SCALE          11.1/3          15.4/2          19.1/2
    HC   SAMPLE  PPM                            111              15              19
    HC   BACKGRD METER READING/SCALE           1.5/3          13.3/2          13.1/2
    HC   BACKGRD PPM                             15              13              13
    CO   SAMPLE  METER READING/SCALE          88.1/*          38.3/*          86.3/*
    CO   SAMPLF  PPM                            429              36              86
    CO   BACKGRD METER READING/SCALE           1.2/*           2.6/*           2.4/*
    CO   BACKGRD PPM                              4               3               2
    CO2  SAMPLE  METER READING/SCALE          95.6/3          64.2/3          84.4/3
    CO2  SAMPLE  PERCENT                       1.80            1.15            1.56
    CO2  BACKGRD METER READING/SCALE           4.3/3           4.1/3           3.4/3
    CO2  BACKGRD PERCENT                        .07             .06             .05
    NOX  SAMPLE  METFR READING/SCALE          40.2/2          15.3/2          39.4/2
    NOX  SAMPLE  PPM                           40.2            15.3            39.4
    NOX  BACKGRD METER READING/SCALE            .8/2            .7/2            .8/2
    NOX  BACKGRD PPM                             .8              .7              .8
    SO2  SAMPLE  METER READING/SCALE         -0.0/*          -0.0/*          -0.0/*
    SO2  SAMPLE  PPM                           40.0            -0.0            -0.0
    SO2  BACKGRD METER READING/SCALE         -0.0/*          -0.0/*          -0.0/*
    SO2  BACKGRD PPM                           -0.0            -0.0            -0.0

    HC   CONCENTRATION PPM                       98               3               8
    CO   CONCENTRATION PPM                      409              33              81
    CO2  CONCENTRATION PCT                     1.74            1.09            1.52
    NOX  CONCENTRATION PPM                     39.5            14.7            38.7
    SO2  CONCENTRATION PPM                      0.0             0.0             0.0
    HC   MASS GRAMS                            4.30             .24             .33
    CO   MASS GRAMS                           36.18            5.00            7.22
    CO2  MASS GRAMS                         2431.56         2614.24         2124.09
    NOX  MASS GRAMS                            4.65            2.96            4.57
    SO2  MASS GRAMS                            0.00            0.00            0.00

    WEIGHTED MASS HC        .19 GRAMS/KILOMETRE
    WEIGHTED MASS CO       2.04 GRAMS/KILOMETRE
    WEIGHTED MASS CO2    403.61 GRAMS/KILOMETRE
    WEIGHTED MASS NOX       .63 GRAMS/KILOMETRE
    WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

    FUEL ECONOMY BY CARBON BALANCE =   5.8  KILOMETRE/LITRE
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        TABLE          EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                                VEHICLE NUMBER EM8

DATE  2/ 6/78               TIME     -0 HRS.          TEST NO.  2
MODEL  1977 FURY PLYMOUTH   SET-7                     ENGINE 5.9 LITREV 8
DRIVER   BP                 TEST WT.  2041 KG.        GVW     0 KG
WET BULB TEMP  13 C         DRY BULB TEMP  24 C       REL. HUM.  25.8 PCT
SPEC. HUM.   5.0 GRAM/KG    BARO.  746.5 MM  HG.      MEASURED FUEL  0.00 KG

  RUN DURATION          23.27 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H2O
  BLOWER DIF.  PRESS. 736.6  MM  H2O
  BLOWER INLET TEMP.      44  DEG. C
  DYNO REVOLUTIONS     32272
  BLOWER REVOLUTIONS    112230
  BLOWER CU. CM /REV.  2232

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE             14.6/2
   HC   SAMPLE  PPM                               15
   HC   BACKGRD METER READING/SCALE             11.4/2
   HC   BACKGRD PPM                               11
   CO   SAMPLE  METER READING/SCALE             66.3/*
   CO   SAMPLE  PPM                               64
   CO   BACKGRD METER READING/SCALE              3.6/*
   CO   BACKGRD PPM                                4
   CO2 SAMPLE  METER READING/SCALE              42.5/2
   CO2 SAMPLE  PERCENT                          1.87
   CO2 BACKGRD METER READING/SCALE               1.5/2
   CO2 BACKGRD PERCENT                           .05
   NOX SAMPLE  METER READING/SCALE              52.9/2
   NOX SAMPLE  PPM                              52.9
   NOX BACKGRD METER READING/SCALE               .6/2
   NOX BACKGRD PPM                                .6
   HC   CONCENTRATION PPM                          5
   CO   CONCENTRATION PPM                         59
   CO2 CONCENTRATION PCT                        1.82
   NOX CONCENTRATION PPM                        52.4
   SO2 COCENTRATION PPM                         0.0
   HC   MASS (GRAMS)                             .58
   CO   MASS (GRAMS)                           14.35
   CO2 MASS (GRAMS)                          7066.35
   NOX MASS (GRAMS)                            17.75
   SO2 MASS (GRAMS)                             0.00

HC   GRAMS/KILOMETRE       .03
CO   GRAMS/KILOMETRE       .65
CO2 GRAMS/KILOMETRE    318
NOX GRAMS/KILOMETRE       .80
SO2 GRAMS/KILOMETRE      0.00

HC   GRAMS/KG OF FUEL     .26     HC   GRAMS/MIN     .03
CO   GRAMS/KG OF FUEL     6.4     CO   GRAMS/MIN      .6
CO2 GRAMS/KG OF FUEL    3158     CO2 GRAMS/MIN     304
NOX GRAMS/KG OF FUEL    7.93     NOX GRAMS/MIN     .76
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =   13.62 LITRES PER HUNDRED KILOMETERS
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       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EMR

DATE  2/ 6/78                 TIME    -0 HRS.          TEST NO.  2
MODEL  1977 FURY PLYMOUTH  SET-7                       ENGINE 5.4 LITREO
RUN DURATION   23.27 MIN.  DISTANCE DRIVEN  22.25 KILOMETRES
CVS BLOWER TEST VOL.  250.51 ACT. CU. METRES

                               SAMPLE                  BACKGROUND
SULFATE DATA                   ------                  ----------

 FILTER NO.                  47FH-2887
 SAMPLE VOL. CU. FT.            15.81                       1.00
 SAMPLE TEMP. DEG. F               81                         70
 SAMPLE AREA SQ. IN.         35617.00                       0.00
 DILUTION FACTOR                    1                          1
 STAND. DEN. MICROG/ML           5.00                       1.00
 STAND. AREA SQ. IN.        143478.00                       1.00
 SO4,MICROG/FILTER             12.412                      0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.             1.00                       1.00
 SAMPLE TEMP. DEG. F               70                         70
 AREA,BUBBLER 1                  0.00                       0.00
 DIL. FACT.,BUBBLER 1               1                          1
 AREA,BUBBLER 2                  0.00                       0.00
 DIL. FACT.,BUBBLER 2               1                          1
 STAND. DEN. MICROG/ML           1.00                       1.00
 STAND. AREA,SQ. IN.             1.00                       1.00
 SO2, MILLIG/BUBBLER 1          0.000                      0.000
 SO2, MILLIG/BUBBLER 2          0.000                      0.000
 SO2, PPM                         0.0                        0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST               7.918
 NET H2SO4,MILLIGRAM/TEST                 8.084
 NET SO2,GRAM/TEST                        0.000
 NET SULFATE,MILLIGRAM/KILOMETRE           .356
 NET H2SO4,MILLIGRAM/KILOMETRE             .363
 NET SO2,GRAM/KILOMETRE                   0.000

SULFUR BALANCE
 FUEL WT., 2237 GRAMS      SULFUR IN FUEL, .0310 PCT.
                               FUEL      SO2       H2SO4      SO2 + H2SO4
                               ----     -----     -------     -----------
           SULFUR,GRAMS         .69     0.000      .0026           .0026
           PCT. RECOVERY                 0.00        .38             .38
       TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EM8

     DATE  2/ 6/78                  TIME    -0 HRS.         TEST NO.  3
     MODEL  1977 FURY PLYMOUTH  FET                         ENGINE 5.9 LITREV 8
     DRIVER   BP                    TEST WT.  2041 KG.      GVW    0 KG
     WET BULB TEMP  15 C            DRY BULB TEMP  26 C     REL. HUM.  28.4 PCT
     SPEC. HUM. . 6.1 GRAM/KG       BARO.  746.5 MM  HG.    MEASURED FUEL  0.00 KG

       RUN DURATION          12.76 MINUTES
       BLOWER INLET PRESS. 736.6  MM. H2O
       BLOWER DIF.  PRESS. 736.6  MM  H2O
       BLOWER INLET TEMP.     42  DEG. C
       DYNO REVOLUTIONS    24159
       BLOWER REVOLUTIONS    61539
       BLOWER CU. CM /REV.  2227

       BAG RESULTS
        HC  SAMPLE  METER READING/SCALE            14.7/2
        HC  SAMPLE  PPM                              15
        HC  BACKGRD METER READING/SCALE            11.9/2
        HC  BACKGRD PPM                              12
        CO  SAMPLE  METER READING/SCALE            51.0/*
        CO  SAMPLE  PPM                              49
        CO  BACKGRD METER READING/SCALE             1.8/*
        CO  BACKGRD PPM                               2
        CO2 SAMPLE  METER READING/SCALE            49.0/2
        CO2 SAMPLE  PERCENT                        2.23
        CO2 BACKGRD METER READING/SCALE             1.9/2
        CO2 BACKGRD PERCENT                         .07
        NOX SAMPLE  METER READING/SCALE            76.0/2
        NOX SAMPLE  PPM                            76.0
        NOX BACKGRD METER READING/SCALE             1.0/2
        NOX BACKGRD PPM                             1.0
        HC  CONCENTRATION PPM                         5
        CO  CONCENTRATION PPM                        45
        CO2 CONCENTRATION PCT                      2.17
        NOX CONCENTRATION PPM                      75.2
        SO2 COCENTRATION PPM                        0.0
        HC  MASS (GRAMS)                            .32
        CO  MASS (GRAMS)                           6.02
        CO2 MASS (GRAMS)                        4619.29
        NOX MASS (GRAMS)                          14.44
        SO2 MASS (GRAMS)                           0.00

     HC  GRAMS/KILOMETRE       .02
     CO  GRAMS/KILOMETRE       .36
     CO2 GRAMS/KILOMETRE   277
     NOX GRAMS/KILOMETRE       .87
     SO2 GRAMS/KILOMETRE      0.00

     HC  GRAMS/KG OF FUEL    .22     HC  GRAMS/MIN    .03
     CO  GRAMS/KG OF FUEL    4.1     CO  GRAMS/MIN     .5
     CO2 GRAMS/KG OF FUEL   3162     CO2 GRAMS/MIN    362
     NOX GRAMS/KG OF FUEL   9.89     NOX GRAMS/MIN   1.13
     SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00
     CARBON BALANCE FUEL ECONOMY =   11.88 LITRES PER HUNDRED KILOMETERS
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                         TABLE                    VEHICLE EMISSION RESULTS
                                               1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.     8        TEST NO. 1          DATE  2/27/78                   MFGR. CODE    -0                 YR.  1977
VEHICLE MODEL  PLYMOUTH FURY              ENGINE    5.90 LITRE 8          CURB WT.      0 KG               GVM      0 KG

BAROMETER 737.11 MM OF HG.                                          WET BULB TEMP  17.2 DEG. C
DRY BULB TEMP.    25.0 DEG. C                                        ABS. HUMIDITY    9.3 GRAMS/KG
REL. HUMIDITY      46 PCT.

EXHAUST EMISSIONS
                                                                    BLOWER INLET PRESS., G1 736.6 MM. H2O
     BLOWER DIF. PRESS., G2, 736.6 MM. H2O                          BLOWER INLET TEMP.    42 DEG. C
     BAG RESULTS
     BAG NO.                                       1              2              3
     BLOWER REVOLUTIONS                          40628          69598          40618
     HC    SAMPLE  METER READING/SCALE            11.8/3         13.9/2         19.5/2
     HC    SAMPLE  PPM                             118            14             19
     HC    BACKGRD METER READING/SCALE             1.2/3         10.6/2         10.2/2
     HC    BACKGRD PPM                              12            11             10
     CO    SAMPLE  METER READING/SCALE            97.1/*         57.6/*         61.1/*
     CO    SAMPLE  PPM                             510            55            137
     CO    BACKGRD METER READING/SCALE             1.1/*          4.0/*           .9/*
     CO    BACKGRD PPM                               3             4              2
     CO2   SAMPLE  METER READING/SCALE            42.6/2         68.8/3         89.0/3
     CO2   SAMPLE  PERCENT                        1.88           1.24           1.66
     CO2   BACKGRD METER READING/SCALE             1.8/2          4.2/3          3.8/3
     CO2   BACKGRD PERCENT                         .07            .06            .06
     NOX   SAMPLE  METER READING/SCALE            49.4/2         18.2/2         51.0/2
     NOX   SAMPLE  PPM                            49.4           18.2           51.0
     NOX   BACKGRD METER READING/SCALE              .9/2           .9/2           .7/2
     NOX   BACKGRD PPM                              .9             .9             .7
     SO2   SAMPLE  METER READING/SCALE           -0.0/*         -0.0/*         -0.0/*
     SO2   SAMPLE  PPM                           -0.0           -0.0           -0.0
     SO2   BACKGRD METER READING/SCALE           -0.0/*         -0.0/*         -0.0/*
     SO2   BACKGRD PPM                           -0.0           -0.0           -0.0

     HC    CONCENTRATION PPM                      108              4             11
     CO    CONCENTRATION PPM                      481             50            129
     CO2   CONCENTRATION PCT                     1.82           1.18           1.61
     NOX   CONCENTRATION PPM                     48.6           17.4           50.4
     SO2   CONCENTRATION PPM                      0.0            0.0            0.0
     HC    MASS GRAMS                            4.69            .32            .46
     CO    MASS GRAMS                           42.27           7.47          11.31
     CO2   MASS GRAMS                         2524.60        2806.02        2226.98
     NOX   MASS GRAMS                            6.70           4.10           6.94
     SO2   MASS GRAMS                            0.00           0.00           0.00

     WEIGHTED MASS HC        .22 GRAMS/KILOMETRE
     WEIGHTED MASS CO       2.66 GRAMS/KILOMETRE
     WEIGHTED MASS CO2    427.68 GRAMS/KILOMETRE
     WEIGHTED MASS NOX       .91 GRAMS/KILOMETRE
     WEIGHTED MASS SO2      0.00 GRAMS/KILOMETRE

     FUEL ECONOMY BY CARBON BALANCE =    5.4  KILOMETRE/LITRE
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TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER EM8

DATE  2/27/78                TIME     -0 HRS.         TEST NO.  2
MODEL  1977 PLYMOUTH FURY    SET-7                    ENGINE 5.9 LITREV 8
DRIVER   BP                  TEST WT.  2041 KG.       GVW    0 KG
WET BULB TEMP  18 C          DRY BULB TEMP  24 C      REL. HUM.  52.0 PCT
SPEC. HUM.  10.2 GRAM/KG     BARO.  738.4 MM  HG.     MEASURED FUEL  0.00 KG
DISTANCE  21.865 KM             FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

 RUN DURATION            23.67 MINUTES
 BLOWER INLET PRESS.     736.6  MM. H20
 BLOWER DIF.  PRESS.     736.6  MM  H20
 BLOWER INLET TEMP.        45  DEG. C
 DYNO REVOLUTIONS      31776
 BLOWER REVOLUTIONS    112669  7760
 BLOWER CU. CM /REV.   2235

 BAG RESULTS
  HC   SAMPLE  METER READING/SCALE                 14.8/ 2
  HC   SAMPLE  PPM                                   15
  HC   BACKGRD METER READING/SCALE                 10.3/ 2
  HC   BACKGRD PPM                                   10
  CO   SAMPLE  METER READING/SCALE                 57.6/12
  CO   SAMPLE  PPM                                  128
  CO   BACKGRD METER READING/SCALE                   .4/12
  CO   BACKGRD PPM                                    1
  CO2  SAMPLE  METER READING/SCALE                 42.7/ 2
  CO2  SAMPLE  PERCENT                             1.88
  CO2  BACKGRD METER READING/SCALE                  1.7/ 2
  CO2  BACKGRD PERCENT                              .06
  NOX  SAMPLE  METER READING/SCALE                 61.8/ 2
  NOX  SAMPLE  PPM                                 61.8
  NOX  BACKGRD METER READING/SCALE                   .9/ 2
  NOX  BACKGRD PPM                                   .9
  HC   CONCENTRATION PPM                              6
  CO   CONCENTRATION PPM                            121
  CO2  CONCENTRATION PCT                           1.83
  NOX  CONCENTRATION PPM                           61.0
  SO2  COCENTRATION PPM                             0.0
  HC   MASS (GRAMS)                                 .72
  CO   MASS (GRAMS)                               29.39
  CO2  MASS (GRAMS)                             6995.80
  NOX  MASS (GRAMS)                               23.99
  SO2  MASS (GRAMS)                                0.00

HC   GRAMS/KM (GRAMS/MILE)        .03 (   .05)
CO   GRAMS/KM (GRAMS/MILE)       1.34 (  2.16)
CO2  GRAMS/KM (GRAMS/MILE)        320 (   515)
NOX  GRAMS/KM (GRAMS/MILE)       1.10 (  1.77)
SO2  GRAMS/KM (GRAMS/MILE)       0.00 (  0.00)

HC   GRAMS/KG OF FUEL     .32     HC   GRAMS/MIN     .03
CO   GRAMS/KG OF FUEL    13.2     CO   GRAMS/MIN     1.2
CO2  GRAMS/KG OF FUEL    3148     CO2  GRAMS/MIN     296
NOX  GRAMS/KG OF FUEL   10.79     NOX  GRAMS/MIN    1.01
SO2  GRAMS/KG OF FUEL    0.00     SO2  GRAMS/MIN    0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      13.75 ( 17.11)

TOTAL CVS FLOW=   209.1STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER EM8

DATE  2/27/78                     TIME     -0 HRS.         TEST NO.  2
MODEL  1977 PLYMOUTH FURY   SET-7                         ENGINE 5.9 LITREO
RUN DURATION    23.67 MIN.   DISTANCE DRIVEN  21.74  KILOMETRES
CVS BLOWER TEST VOL.   251.84 ACT. CU. METRES

                                  SAMPLE                    BACKGROUND
SULFATE DATA                      ------                    ----------

 FILTER NO.                     47FH-2889
 SAMPLE VOL. CU. FT.              16.42                        1.00
 SAMPLE TEMP. DEG. F                81                           70
 SAMPLE AREA SQ. IN.          39416.00                         0.00
 DILUTION FACTOR                     1                            1
 STAND. DEN. MICROG/ML             5.00                        1.00
 STAND. AREA SQ. IN.         155402.00                         1.00
 SO4,MICROG/FILTER               12.641                        0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.               1.00                        1.00
 SAMPLE TEMP. DEG. F                 70                          70
 AREA,BUBBLER 1                    0.00                        0.00
 DIL. FACT.,BUBBLER 1                 1                           1
 AREA,BUBBLER 2                    0.00                        0.00
 DIL. FACT.,BUBBLER 2                 1                           1
 STAND. DEN. MICROG/ML             1.00                        1.00
 STAND. AREA,SQ. IN.               1.00                        1.00
 SO2, MILLIG/BUBBLER 1            0.000                        0.000
 SO2, MILLIG/BUBBLER 2            0.000                        0.000
 SO2, PPM                           0.0                          0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST                  7.826
 NET H2SO4,MILLIGRAM/TEST                    7.990
 NET SO2,GRAM/TEST                           0.000
 NET SULFATE,MILLIGRAM/KILOMETRE              .360
 NET H2SO4,MILLIGRAM/KILOMETRE                .368
 NET SO2,GRAM/KILOMETRE                      0.000

SULFUR BALANCE
 FUEL WT., 2232 GRAMS       SULFUR IN FUEL, .0310 PCT.
                              FUEL      SO2        H2SO4        SO2 + H2SO4
                              ----     -----      -------       -----------
              SULFUR,GRAMS     .69     0.000       .0026              .0026
              PCT. RECOVERY            0.00         .38                .38
      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER EM8

DATE  2/27/78                  TIME    -0 HRS.         TEST NO.  3
MODEL  1977 PLYMOUTH FURY      FET                     ENGINE 5.9 LITREV 8
DRIVER   BP                    TEST WT.  2041 KG.      GVW    0 KG
WET BULB TEMP  18 C            DRY BULB TEMP  25 C     REL. HUM.  52.6 PCT
SPEC. HUM.  10.7 GRAM/KG       BARO.  738.4 MM  HG.    MEASURED FUEL  0.00 KG

  RUN DURATION          12.74 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H2O
  BLOWER DIF.  PRESS. 736.6  MM  H2O
  BLOWER INLET TEMP.      43  DEG. C
  DYNO REVOLUTIONS    23535
  BLOWER REVOLUTIONS    61429
  BLOWER CU. CM /REV.  2230

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE            14.2/2
   HC   SAMPLE  PPM                             14
   HC   BACKGRD METER READING/SCALE            10.1/2
   HC   BACKGRD PPM                             10
   CO   SAMPLE  METER READING/SCALE            54.4/*
   CO   SAMPLE  PPM                            121
   CO   BACKGRD METER READING/SCALE              .7/*
   CO   BACKGRD PPM                              1
   CO2  SAMPLE  METER READING/SCALE            50.9/2
   CO2  SAMPLE  PERCENT                        2.33
   CO2  BACKGRD METER READING/SCALE             1.6/2
   CO2  BACKGRD PERCENT                         .06
   NOX  SAMPLE  METER READING/SCALE            85.8/2
   NOX  SAMPLE  PPM                            85.8
   NOX  BACKGRD METER READING/SCALE             1.0/2
   NOX  BACKGRD PPM                             1.0
   HC   CONCENTRATION PPM                        6
   CO   CONCENTRATION PPM                      112
   CO2  CONCENTRATION PCT                      2.29
   NOX  CONCENTRATION PPM                      85.0
   SO2  COCENTRATION PPM                       0.0
   HC   MASS (GRAMS)                           .39
   CO   MASS (GRAMS)                          14.89
   CO2  MASS (GRAMS)                        4792.07
   NOX  MASS (GRAMS)                          18.51
   SO2  MASS (GRAMS)                          0.00

HC   GRAMS/KILOMETRE       .02
CO   GRAMS/KILOMETRE       .90
CO2  GRAMS/KILOMETRE    291
NOX  GRAMS/KILOMETRE      1.12
SO2  GRAMS/KILOMETRE      0.00

HC   GRAMS/KG OF FUEL     .25      HC   GRAMS/MIN     .03
CO   GRAMS/KG OF FUEL     4.8      CO   GRAMS/MIN     1.2
CO2  GRAMS/KG OF FUEL    3153      CO2  GRAMS/MIN     376
NOX  GRAMS/KG OF FUEL   12.18      NOX  GRAMS/MIN    1.45
SO2  GRAMS/KG OF FUEL    0.00      SO2  GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =   12.49 LITRES PER HUNDRED KILOMETERS
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                   TABLE                   VEHICLE EMISSION RESULTS
                                     1975  LIGHT DUTY EMISSIONS TEST
UNIT NO.  EM8       TEST NO. 1        DATE  4/ 7/78               MFGR. CODE   -0                YR.  1977
VEHICLE MODEL  FURY PLY               ENGINE   5.90 LITRE 8       CURB WT.      0 KG             GVM      0 KG

BAROMETER 742.95 MM OF HG.                                  WET BULB TEMP  18.9 DEG. C
DRY BULB TEMP.   26.1 DEG. C                                 ABS. HUMIDITY  10.8 GRAMS/KG
REL. HUMIDITY     50 PCT.

EXHAUST EMISSIONS
                                                            BLOWER INLET PRESS., G1 749.3 MM. H2O
   BLOWER DIF. PRESS., G2, 749.3 MM. H2O                    BLOWER INLET TEMP.   43 DEG. C
   BAG RESULTS
   BAG NO.                                    1               2               3
   BLOWER REVOLUTIONS                      40703           69494           40716
   HC    SAMPLE  METER READING/SCALE        12.6/3          16.3/2          19.8/2
   HC    SAMPLE  PPM                        126             16              20
   HC    BACKGRD METER READING/SCALE        1.6/3           15.2/2          14.4/2
   HC    BACKGRD PPM                        16              15              14
   CO    SAMPLE  METER READING/SCALE        23.8/3          23.8/*          54.4/*
   CO    SAMPLE  PPM                        550             23              52
   CO    BACKGRD METER READING/SCALE        .1/3            3.5/*           2.4/*
   CO    BACKGRD PPM                        2               3               2
   CO2   SAMPLE  METER READING/SCALE        42.1/2          67.3/3          85.8/3
   CO2   SAMPLE  PERCENT                    1.85            1.21            1.59
   CO2   BACKGRD METER READING/SCALE        1.5/2           4.5/3           4.5/3
   CO2   BACKGRD PERCENT                    .05             .07             .07
   NOX   SAMPLE  METER READING/SCALE        27.6/2          11.8/2          33.1/2
   NOX   SAMPLE  PPM                        27.6            11.8            33.1
   NOX   BACKGRD METER READING/SCALE        .9/2            1.0/2           1.2/2
   NOX   BACKGRD PPM                        .9              1.0             1.2
   SO2   SAMPLE  METER READING/SCALE        -0.0/*          -0.0/*          -0.0/*
   SO2   SAMPLE  PPM                        0.0             0.0             0.0
   SO2   BACKGRD METER READING/SCALE        -0.0/*          -0.0/*          -0.0/*
   SO2   BACKGRD PPM                        0.0             0.0             0.0

   HC    CONCENTRATION PPM                  112             2               7
   CO    CONCENTRATION PPM                  520             19              48
   CO2   CONCENTRATION PCT                  1.80            1.15            1.53
   NOX   CONCENTRATION PPM                  26.8            10.9            32.0
   SO2   CONCENTRATION PPM                  0.0             0.0             0.0
   HC    MASS GRAMS                         4.92            .19             .31
   CO    MASS GRAMS                         46.02           2.81            4.21
   CO2   MASS GRAMS                       2520.24         2735.31         2138.30
   NOX   MASS GRAMS                         3.92            2.71            4.68
   SO2   MASS GRAMS                         0.00            0.00            0.00

   WEIGHTED MASS HC       .21 GRAMS/KILOMETRE
   WEIGHTED MASS CO      2.07 GRAMS/KILOMETRE
   WEIGHTED MASS CO2   417.47 GRAMS/KILOMETRE
   WEIGHTED MASS NOX      .59 GRAMS/KILOMETRE
   WEIGHTED MASS SO2     0.00 GRAMS/KILOMETRE

   FUEL ECONOMY BY CARBON BALANCE =   5.6  KILOMETRE/LITRE
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                          VEHICLE NUMBER EM8

DATE  4/ 7/78                  TIME    -0 HRS.        TEST NO.  2
MODEL  1977 FURY PLYMOUTH  SET-7                    ENGINE 5.9 LITRE  8
DRIVER   BP                    TEST WT.  2041 KG.     GVW    0 KG
WET BULB TEMP  20 C            DRY BULB TEMP  28 C    REL. HUM.  48.8 PCT
SPEC. HUM.  11.7 GRAM/KG       BARO.  740.2 MM  HG.   MEASURED FUEL  0.00 KG

  RUN DURATION          23.28 MINUTES
  BLOWER INLET PRESS. 736.6  MM. H2O
  BLOWER DIF.  PRESS. 736.6  MM  H2O
  BLOWER INLET TEMP.     43  DEG. C
  DYNO REVOLUTIONS    31359
  BLOWER REVOLUTIONS  112471
  BLOWER CU. CM /REV.  2228

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE             14.4/2
   HC  SAMPLE  PPM                                14
   HC  BACKGRD METER READING/SCALE             12.8/2
   HC  BACKGRD PPM                                13
   CO  SAMPLE  METER READING/SCALE             54.5/*
   CO  SAMPLE  PPM                                52
   CO  BACKGRD METER READING/SCALE               .1/*
   CO  BACKGRD PPM                                 0
   CO2 SAMPLE  METER READING/SCALE             96.8/3
   CO2 SAMPLE  PERCENT                          1.82
   CO2 BACKGRD METER READING/SCALE              4.1/3
   CO2 BACKGRD PERCENT                           .06
   NOX SAMPLE  METER READING/SCALE             29.4/2
   NOX SAMPLE  PPM                              29.4
   NOX BACKGRD METER READING/SCALE              1.2/2
   NOX BACKGRD PPM                               1.2
   HC  CONCENTRATION PPM                           3
   CO  CONCENTRATION PPM                          49
   CO2 CONCENTRATION PCT                        1.77
   NOX CONCENTRATION PPM                        28.4
   SO2 COCENTRATION PPM                          0.0
   HC  MASS (GRAMS)                              .40
   CO  MASS (GRAMS)                            12.06
   CO2 MASS (GRAMS)                          6807.14
   NOX MASS (GRAMS)                            11.73
   SO2 MASS (GRAMS)                             0.00

HC  GRAMS/KILOMETRE       .02
CO  GRAMS/KILOMETRE       .55
CO2 GRAMS/KILOMETRE    313
NOX GRAMS/KILOMETRE       .54
SO2 GRAMS/KILOMETRE      0.00

HC  GRAMS/KG OF FUEL     .19     HC  GRAMS/MIN     .02
CO  GRAMS/KG OF FUEL     5.6     CO  GRAMS/MIN      .5
CO2 GRAMS/KG OF FUEL    3160     CO2 GRAMS/MIN     292
NOX GRAMS/KG OF FUEL    5.45     NOX GRAMS/MIN     .50
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =    13.42 LITRES PER HUNDRED KILOMETERS
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      TABLE       EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                         VEHICLE NUMBER EM8

DATE  4/ 7/78               TIME    -0 HRS.         TEST NO.  2
MODEL  1977 FURY PLYMOUTH  SET-7                    ENGINE 5.9 LITREO
RUN DURATION   23.28 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  250.61 ACT. CU. METRES

                            SAMPLE                  BACKGROUND
SULFATE DATA                ------                  ----------

 FILTER NO.               47FH-2905
 SAMPLE VOL. CU. FT.          17.33                     1.00
 SAMPLE TEMP. DEG. F             90                       70
 SAMPLE AREA SQ. IN.       44174.00                     0.00
 DILUTION FACTOR                  1                        1
 STAND. DEN. MICROG/ML         5.00                     1.00
 STAND. AREA SQ. IN.      157162.00                     1.00
 SO4,MICROG/FILTER           14.054                    0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.           1.00                     1.00
 SAMPLE TEMP. DEG. F             70                       70
 AREA,BUBBLER 1                0.00                     0.00
 DIL. FACT.,BUBBLER 1             1                        1
 AREA,BUBBLER 2                0.00                     0.00
 DIL. FACT.,BUBBLER 2             1                        1
 STAND. DEN. MICROG/ML         1.00                     1.00
 STAND. AREA,SQ. IN.           1.00                     1.00
 SO2, MILLIG/BUBBLER 1        0.000                    0.000
 SO2, MILLIG/BUBBLER 2        0.000                    0.000
 SO2, PPM                       0.0                      0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST                 8.026
 NET H2SO4,MILLIGRAM/TEST                   8.194
 NET SO2,GRAM/TEST                          0.000
 NET SULFATE,MILLIGRAM/KILOMETRE             .369
 NET H2SO4,MILLIGRAM/KILOMETRE               .377
 NET SO2,GRAM/KILOMETRE                     0.000

SULFUR BALANCE
 FUEL WT., 2154 GRAMS      SULFUR IN FUEL, .0310 PCT.
                            FUEL     SO2      H2SO4       SO2 + H2SO4
                            ----    -----    -------     ------------
             SULFUR,GRAMS    .67    0.000      .0027            .0027
             PCT. RECOVERY           0.00        .40              .40
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TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                      VEHICLE NUMBER EM8

DATE  4/ 7/78              TIME     -0 HRS.        TEST NO.  3
MODEL  1977 FURY PLYMOUTH  FET                     ENGINE 5.9 LITREV 8
DRIVER   BP                TEST WT.  2041 KG.      GVW    0 KG
WET BULB TEMP  19 C        DRY.BULB TEMP  27 C     REL. HUM.  45.0 PCT
SPEC. HUM.  10.4 GRAM/KG   BARO.  740.2 MM  HG.    MEASURED FUEL  0.00 KG

 RUN DURATION          12.74 MINUTES
 BLOWER INLET PRESS. 736.6  MM. H2O
 BLOWER DIF.  PRESS. 736.6  MM  H2O
 BLOWER INLET TEMP.     43  DEG. C
 DYNO REVOLUTIONS     23523
 BLOWER REVOLUTIONS    61831
 BLOWER CU. CM /REV.  2229

 BAG RESULTS
  HC   SAMPLE  METER READING/SCALE            15.2/2
  HC   SAMPLE  PPM                              15
  HC   BACKGRD METER READING/SCALE            12.3/2
  HC   BACKGRD PPM                              12
  CO   SAMPLE  METER READING/SCALE            50.0/*
  CO   SAMPLE  PPM                              48
  CO   BACKGRD METER READING/SCALE             2.2/*
  CO   BACKGRD PPM                               2
  CO2  SAMPLE  METER READING/SCALE            48.0/2
  CO2  SAMPLE  PERCENT                        2.17
  CO2  BACKGRD METER READING/SCALE             1.6/2
  CO2  BACKGRD PERCENT                         .06
  NOX  SAMPLE  METER READING/SCALE            37.9/2
  NOX  SAMPLE  PPM                            37.9
  NOX  BACKGRD METER READING/SCALE             1.3/2
  NOX  BACKGRD PPM                             1.3
  HC   CONCENTRATION PPM                         5
  CO   CONCENTRATION PPM                        43
  CO2  CONCENTRATION PCT                      2.12
  NOX  CONCENTRATION PPM                      36.8
  SO2  COCENTRATION PPM                       0.0
  HC   MASS (GRAMS)                            .33
  CO   MASS (GRAMS)                           5.79
  CO2  MASS (GRAMS)                        4499.81
  NOX  MASS (GRAMS)                           8.03
  SO2  MASS (GRAMS)                           0.00

HC   GRAMS/KILOMETRE       .02
CO   GRAMS/KILOMETRE       .35
CO2  GRAMS/KILOMETRE    273
NOX  GRAMS/KILOMETRE       .49
SO2  GRAMS/KILOMETRE      0.00

HC   GRAMS/KG OF FUEL    .23     HC   GRAMS/MIN     .03
CO   GRAMS/KG OF FUEL   4.1      CO   GRAMS/MIN     .5
CO2  GRAMS/KG OF FUEL  3162      CO2  GRAMS/MIN    353
NOX  GRAMS/KG OF FUEL   5.65     NOX  GRAMS/MIN     .63
SO2  GRAMS/KG OF FUEL   0.00     SO2  GRAMS/MIN    0.00
CARBON BALANCE FUEL ECONOMY =    11.68 LITRES PER HUNDRED KILOMETERS
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          TABLE                     VEHICLE EMISSION RESULTS
                                 1978  LIGHT DUTY EMISSIONS TEST
                               ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EMB      TEST NO.     1         DATE  4/11/78                MFGR. CODE    -0                YR.  1977
VEHICLE MODEL  FURY PLYMOUTH              ENGINE   5.90 LITRE 8        CURB WT.      0 KG              GVM     0 KG

BAROMETER 740.92 MM OF HG.                                        WET BULB TEMP  13.9 DEG. C
DRY BULB TEMP.    24.4 DEG. C                                      ABS. HUMIDITY   5.6 GRAMS/KG
REL. HUMIDITY      29 PCT.                                         COMMENTS  1978 FTP-C

EXHAUST EMISSIONS
                                                                  BLOWER INLET PRESS., G1 762.0 MM. H2O
     BLOWER DIF. PRESS., G2, 762.0 MM. H2O                        BLOWER INLET TEMP.    42 DEG. C
     BAG RESULTS
     BAG NO.                                      1              2              3
     BLOWER REVOLUTIONS                         40880          70691          40591
     HC    SAMPLE  METER READING/SCALE           70.7/ 2        11.8/ 2        21.1/ 2
     HC    SAMPLE  PPM                           71             12             21
     HC    BACKGRD METER READING/SCALE           8.6/ 2         7.1/ 2         7.2/ 2
     HC    BACKGRD PPM                           9              7              7
     CO    SAMPLE  METER READING/SCALE          93.2/11        24.3/13        66.5/13
     CO    SAMPLE  PPM                          473            23             65
     CO    BACKGRD METER READING/SCALE           .8/11         1.4/13         5.2/13
     CO    BACKGRD PPM                           2              1              5
     CO2   SAMPLE  METER READING/SCALE          42.0/ 2        66.9/ 3        88.8/ 3
     CO2   SAMPLE  PERCENT                      1.84           1.20           1.65
     CO2   BACKGRD METER READING/SCALE           1.6/ 2         3.5/ 3         4.0/ 3
     CO2   BACKGRD PERCENT                      .06            .05            .06
     NOX   SAMPLE  METER READING/SCALE          34.6/ 2        15.8/ 2        42.0/ 2
     NOX   SAMPLE  PPM                          34.6           15.8           42.0
     NOX   BACKGRD METER READING/SCALE           .7/ 2          .4/ 2          .4/ 2
     NOX   BACKGRD PPM                           .7             .4             .4
     SO2   SAMPLE  METER READING/SCALE          -0.0/-0        -0.0/-0        -0.0/-0
     SO2   SAMPLE  PPM                          -0.0           -0.0           -0.0
     SO2   BACKGRD METER READING/SCALE          -0.0/-0        -0.0/-0        -0.0/-0
     SO2   BACKGRD PPM                          -0.0           -0.0           -0.0

     HC    CONCENTRATION PPM                     63              5             15
     CO    CONCENTRATION PPM                    450             21             58
     CO2   CONCENTRATION PCT                    1.79           1.15           1.60
     NOX   CONCENTRATION PPM                    34.0           15.4           41.6
     SO2   CONCENTRATION PPM                    0.0            0.0            0.0
     HC    MASS GRAMS                           2.78            .41            .64
     CO    MASS GRAMS                          39.86           3.23           5.06
     CO2   MASS GRAMS                        2499.61        2776.36        2210.77
     NOX   MASS GRAMS                           4.24           3.33           5.15
     SO2   MASS GRAMS                           0.00           0.00           0.00
     HC GRAMS/KM (GRAMS/MILE)                   .48 (   .78)    .07 (   .11)    .11 (   .18)
     CO GRAMS/KM (GRAMS/MILE)                  6.95 ( 11.18)    .53 (   .85)    .88 (  1.41)
     CO2 GRAMS/KM (GRAMS/MILE)               435.78 (701.17) 451.83 (726.99) 383.99 (617.84)
     NOX GRAMS/KM (GRAMS/MILE)                  .74 (  1.19)    .54 (   .87)    .89 (  1.44)
     FUEL CONSUMPTION BY CB  L/100KM (MPG)    19.13 ( 12.30)  19.33 ( 12.17)  16.46 ( 14.29)
     CVS FLOW STD. CU. METRES (SCF)            76.1 (2686.1)  131.6 (4646.2)   75.5 (2666.0)
     CALCULATED DISTANCE KM(MILES)             5.74 (  3.56)   6.14 (  3.82)   5.76 (  3.58)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)        18.50 ( 12.72)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                .17 (   .27)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)               1.96 (  3.15)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)            429.79 (691.54)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)               .68 (  1.09)
    TOTAL CVS FLOW =   283.2 STD. CU. METRES
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      TARLE         EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EM8

   DATE  4/11/78              TIME    -0 HRS.          TEST NO.  2
   MODEL  1977 FURY PLYMOUTH  SET-7                    ENGINE 5.9 LITREV 8
   DRIVER   BP                TEST WT.  2041 KG.       GVW    0 KG
   WET BULB TEMP  16 C        DRY BULB TEMP  26 C      REL. HUM.  33.7 PCT
   SPEC. HUM.   7.0 GRAM/KG   BARO.  740.4 MM  HG.     MEASURED FUEL  0.00 KG
   DISTANCE  21.500 KM          FUEL 738.2 G/LITRE     FUEL HC  RATIO 1.860

     RUN DURATION            23.29 MINUTES
     BLOWER INLET PRESS.    762.0  MM. H2O
     BLOWER DIF.  PRESS.    762.0  MM  H2O
     BLOWER INLET TEMP.       43  DEG. C
     DYNO REVOLUTIONS     31246
     BLOWER REVOLUTIONS   112262
     BLOWER CU. CM /REV.  2226

     BAG RESULTS
      HC  SAMPLE  METER READING/SCALE              11.7/ 2
      HC  SAMPLE  PPM                                 12
      HC  BACKGRD METER READING/SCALE               7.6/ 2
      HC  BACKGRD PPM                                  8
      CO  SAMPLE  METER READING/SCALE              62.5/13
      CO  SAMPLE  PPM                                 60
      CO  BACKGRD METER READING/SCALE               3.7/13
      CO  BACKGRD PPM                                  4
      CO2 SAMPLE  METER READING/SCALE              41.8/ 2
      CO2 SAMPLE  PERCENT                          1.83
      CO2 BACKGRD METER READING/SCALE               1.6/ 2
      CO2 BACKGRD PERCENT                           .06
      NOX SAMPLE  METER READING/SCALE              41.5/ 2
      NOX SAMPLE  PPM                              41.5
      NOX BACKGRD METER READING/SCALE               1.2/ 2
      NOX BACKGRD PPM                               1.2
      HC  CONCENTRATION PPM                           5
      CO  CONCENTRATION PPM                          54
      CO2 CONCENTRATION PCT                        1.78
      NOX CONCENTRATION PPM                        40.5
      SO2 COCENTRATION PPM                          0.0
      HC  MASS (GRAMS)                              .62
      CO  MASS (GRAMS)                            13.23
      CO2 MASS (GRAMS)                          6808.31
      NOX MASS (GRAMS)                            14.38
      SO2 MASS (GRAMS)                             0.00

   HC  GRAMS/KM (GRAMS/MILE)       .03 (   .05)
   CO  GRAMS/KM (GRAMS/MILE)       .62 (   .99)
   CO2 GRAMS/KM (GRAMS/MILE)       317 (   510)
   NOX GRAMS/KM (GRAMS/MILE)       .67 (  1.08)
   SO2 GRAMS/KM (GRAMS/MILE)      0.00 (  0.00)

   HC  GRAMS/KG OF FUEL    .29     HC  GRAMS/MIN    .03
   CO  GRAMS/KG OF FUEL    6.1     CO  GRAMS/MIN    .6
   CO2 GRAMS/KG OF FUEL   3159     CO2 GRAMS/MIN    292
   NOX GRAMS/KG OF FUEL   6.67     NOX GRAMS/MIN    .62
   SO2 GRAMS/KG OF FUEL   0.00     SO2 GRAMS/MIN   0.00

   CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      13.56 ( 17.35)

   TOTAL CVS FLOW=   208.6STD. CU. METRES
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TABLE         EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                     VEHICLE NUMBER EM8

DATE  4/11/78              TIME    -0 HRS.        TEST NO.  2
MODEL  1977 FURY PLYMOUTH  SET-7                  ENGINE 5.9 LITREO
RUN DURATION   23.29 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  249.87 ACT. CU. METRES

                             SAMPLE                BACKGROUND
SULFATE DATA                 ------                ----------

 FILTER NO.                47FH-2913
 SAMPLE VOL. CU. FT.         16.42                    1.00
 SAMPLE TEMP. DEG. F            82                      70
 SAMPLE AREA SQ. IN.      33190.00                    0.00
 DILUTION FACTOR                 1                       1
 STAND. DEN. MICROG/ML        5.00                    1.00
 STAND. AREA SQ. IN.     161767.00                    1.00
 SO4,MICROG/FILTER          10.259                   0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.          1.00                    1.00
 SAMPLE TEMP. DEG. F            70                      70
 AREA,BUBBLER 1               0.00                    0.00
 DIL. FACT.,BUBBLER 1            1                       1
 AREA,BUBBLER 2               0.00                    0.00
 DIL. FACT.,BUBBLER 2            1                       1
 STAND. DEN. MICROG/ML        1.00                    1.00
 STAND. AREA,SQ. IN.          1.00                    1.00
 SO2, MILLIG/BUBBLER 1       0.000                   0.000
 SO2, MILLIG/BUBBLER 2       0.000                   0.000
 SO2, PPM                      0.0                     0.0

SULFATE AND SO2 EMISSIONS

NET SULFATE,MILLIGRAM/TEST               6.273
NET H2SO4,MILLIGRAM/TEST                 6.404
NET SO2,GRAM/TEST                        0.000
NET SULFATE,MILLIGRAM/KILOMETRE           .289
NET H2SO4,MILLIGRAM/KILOMETRE             .295
NET SO2,GRAM/KILOMETRE                   0.000

SULFUR BALANCE
 FUEL WT., 2164 GRAMS       SULFUR IN FUEL, .0310 PCT.
                             FUEL     SO2      H2SO4       SO2 +.H2SO4
                             ----    -----    -------     -----------
           SULFUR,GRAMS       .67    0.000     .0021           .0021
           PCT. RECOVERY             0.00       .31             .31
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        TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EM8

DATE  4/11/78                  TIME     -0 HRS.         TEST NO.  3
MODEL  1977 FURY PLYMOUTH  FET                          ENGINE 5.9 LITREV 8
DRIVER   RP                    TEST WT.  2041 KG.       GVW    0 KG
WET BULB TEMP  11 C            DRY BULB TEMP  24 C      REL. HUM.  16.2 PCT
SPEC. HUM.   3.0 GRAM/KG   BARO.  740.4 MM  HG.     MEASURED FUEL  0.00 KG
DISTANCE  16.245 KM              FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

  RUN DURATION           12.74 MINUTES
  BLOWER INLET PRESS.    762.0  MM. H20
  BLOWER DIF.  PRESS.    762.0  MM  H20
  BLOWER INLET TEMP.       42  DEG. C
  DYNO REVOLUTIONS     23608
  BLOWER REVOLUTIONS     61495
  BLOWER CU. CM /REV.  2222

  BAG RESULTS
   HC   SAMPLF  METER READING/SCALE                11.2/ 2
   HC   SAMPLE  PPM                                  11
   HC   BACKGRD METER READING/SCALE                  6.8/ 2
   HC   BACKGRD PPM                                   7
   CO   SAMPLF  METER READING/SCALE                62.3/13
   CO   SAMPLE  PPM                                  60
   CO   BACKGRD METER READING/SCALE                  4.9/13
   CO   BACKGRD PPM                                   5
   CO2 SAMPLE  METER READING/SCALE                 48.0/ 2
   CO2 SAMPLE  PERCENT                             2.17
   CO2 BACKGRD METER READING/SCALE                  1.5/ 2
   CO2 BACKGRD PERCENT                              .05
   NOX SAMPLE  METER READING/SCALE                 52.3/ 2
   NOX SAMPLE  PPM                                 52.3
   NOX BACKGRD METER READING/SCALE                   .4/ 2
   NOX BACKGRD PPM                                   .4
   HC  CONCENTRATION PPM                              6
   CO  CONCENTRATION PPM                             53
   CO2 CONCENTRATION PCT                           2.12
   NOX CONCENTRATION PPM                           52.0
   SO2 COCENTRATION PPM                            0.0
   HC   MASS (GRAMS)                               .36
   CO   MASS (GRAMS)                               7.11
   CO2 MASS (GRAMS)                             4450.61
   NOX MASS (GRAMS)                                9.08
   SO2 MASS (GRAMS)                                0.00

HC   GRAMS/KM (GRAMS/MILE)          .02 (    .04)
CO   GRAMS/KM (GRAMS/MILE)          .44 (    .70)
CO2 GRAMS/KM (GRAMS/MILE)           274 (    441)
NOX GRAMS/KM (GRAMS/MILE)           .56 (    .90)
SOP GRAMS/KM (GRAMS/MILE)          0.00 (  0.00)

HC   GRAMS/KG OF FUEL      .26      HC   GRAMS/MIN     .03
CO   GRAMS/KG OF FUEL      5.0      CO   GRAMS/MIN      .6
CO2 GRAMS/KG OF FUEL     3161      CO2 GRAMS/MIN     349
NOX GRAMS/KG OF FUEL     6.44      NOX GRAMS/MIN     .71
SOP GRAMS/KG OF FUEL     0.00      SO2 GRAMS/MIN    0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)       11.73 ( 20.06)

TOTAL CVS FLOW=   114.5STD. CU. METRES
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                       TABLE              VEHICLE EMISSION RESULTS
                                         1978  LIGHT DUTY EMISSIONS TEST
                                      ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM8      TEST NO.      1       DATE  5/ 3/78                  MFGR. CODE   -0              YR.  1977
VEHICLE MODEL  PLY FURY                  ENGINE   5.90 LITRE 8          CURB WT.      0 KG           GVM     0 KG

BAROMETER 734.31 MM OF HG.                                          WET BULB TEMP  13.9 DEG. C
DRY BULB TEMP.    22.8 DEG. C                                        ABS. HUMIDITY   6.4 GRAMS/KG
REL. HUMIDITY      36 PCT.                                           COMMENTS  1978 FTPC

EXHAUST EMISSIONS

   BLOWER DIF. PRESS., G2, 736.6 MM. H2O                            BLOWER INLET PRESS., G1 736.6 MM. H2O
   BAG RESULTS   .                                                  BLOWER INLET TEMP.    45 DEG. C
   BAG NO.                                    1                2                  3
   BLOWER REVOLUTIONS                       40663            69520              40543
   HC    SAMPLE  METER READING/SCALE         33.4/ 3          11.8/ 2            38.7/ 2
   HC    SAMPLE  PPM                        334               12                 39
   HC    BACKGRD METER READING/SCALE          1.1/ 3          10.0/ 2             9.9/ 2
   HC    BACKGRD PPM                         11               10                 10
   CO    SAMPLE  METER READING/SCALE         54.4/ 3          29.0/13            25.0/ 3
   CO    SAMPLE  PPM                        1347              27                579
   CO    BACKGRD METER READING/SCALE           .1/ 3           3.0/13              .1/ 3
   CO    BACKGRD PPM                          2                3                  2
   CO2   SAMPLE  METER READING/SCALE         97.1/ 3          67.4/ 3            87.2/ 3
   CO2   SAMPLE  PERCENT                     1.83             1.21               1.62
   CO2   BACKGRD METER READING/SCALE          3.5/ 3           2.7/ 3             2.1/ 3
   CO2   BACKGRD PERCENT                      .05              .04                .03
   NOX   SAMPLE  METER READING/SCALE         36.5/ 2          23.0/ 2            48.4/ 2
   NOX   SAMPLE  PPM                         36.5             23.0               48.4
   NOX   BACKGRD METER READING/SCALE           .9/ 2            .9/ 2              .9/ 2
   NOX   BACKGRD PPM                           .9               .9                 .9
   SO2   SAMPLE  METER READING/SCALE        -0.0/-0          -0.0/-0            -0.0/-0
   SO2   SAMPLE  PPM                        -0.0             -0.0               -0.0
   SO2   BACKGRD METER READING/SCALE        -0.0/-0          -0.0/-0            -0.0/-0
   SO2   BACKGRD PPM                        -0.0             -0.0               -0.0

   HC    CONCENTRATION PPM                   325                3                 30
   CO    CONCENTRATION PPM                  1282               24                552
   CO2   CONCENTRATION PCT                   1.78             1.17               1.59
   NOX   CONCENTRATION PPM                   35.7             22.2               47.6
   SO2   CONCENTRATION PPM                    0.0              0.0                0.0
   HC    MASS GRAMS                         14.04              .20               1.30
   CO    MASS GRAMS                        111.94             3.56              48.10
   CO2   MASS GRAMS                       2446.58          2755.62            2178.99
   NOX   MASS GRAMS                          4.49             4.77               5.97
   SO2   MASS GRAMS                          0.00             0.00               0.00
   HC GRAMS/KM (GRAMS/MILE)                 2.47 (  3.98)     .03 (   .05)     .23 (   .36)
   CO GRAMS/KM (GRAMS/MILE)                19.71 ( 31.72)     .58 (   .93)    8.39 ( 13.50)
   CO2 GRAMS/KM (GRAMS/MILE)              430.87 (693.28)  445.36 (716.59)  380.25 (611.82)
   NOX GRAMS/KM (GRAMS/MILE)                 .79 (  1.27)     .77 (  1.24)    1.04 (  1.68)
   FUEL CONSUMPTION BY CB  L/100KM (MPG)   20.05 ( 11.73)   19.05 ( 12.35)   16.82 ( 13.98)
   CVS FLOW STD. CU. METRES (SCF)           75.0 (2648.3)   128.2 (4527.4)    74.8 (2640.4)
   CALCULATED DISTANCE KM(MILES)            5.68 (  3.53)    6.19 (  3.85)    5.73 (  3.56)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)        18.65 ( 12.62)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                .59 (   .95)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)               6.66 ( 10.71)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)            424.53 (683.07)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)               .85 (  1.37)
    TOTAL CVS FLOW =    278.0 STD. CU. METRES
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TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                       VEHICLE NUMBER EM8

DATE  5/ 2/78               TIME     -0 HRS.          TEST NO.  2
MODEL  1977 PLY FURY        SET 7                     ENGINE 5.9 LITREV 8
DRIVER   JC                 TEST WT.  2041 KG.        GVW     0 KG
WET BULB TEMP  14 C         DRY BULB TEMP  25 C       REL. HUM.  30.1 PCT
SPEC. HUM.   6.1 GRAM/KG    BARO.  733.0 MM  HG.      MEASURED FUEL  0.00 KG
DISTANCE  21.630 KM           FUEL 738.2 G/LITRE      FUEL HC  RATIO 1.860

  RUN DURATION           23.30 MINUTES
  BLOWER INLET PRESS.    749.3  MM. H20
  BLOWER DIF.  PRESS.    749.3  MM  H20
  BLOWER INLET TEMP.      43  DEG. C
  DYNO REVOLUTIONS      31434
  BLOWER REVOLUTIONS    112292
  BLOWER CU. CM /REV.   2228

  BAG RESULTS
   HC  SAMPLE  METER READING/SCALE                15.0/ 2
   HC  SAMPLE  PPM                                 15
   HC  BACKGRD METER READING/SCALE                12.7/ 2
   HC  BACKGRD PPM                                 13
   CO  SAMPLE  METER READING/SCALE                67.0/13
   CO  SAMPLE  PPM                                 65
   CO  BACKGRD METER READING/SCALE                 4.5/13
   CO  BACKGRD PPM                                  4
   CO2 SAMPLE  METER READING/SCALE                42.6/ 2
   CO2 SAMPLE  PERCENT                            1.88
   CO2 BACKGRD METER READING/SCALE                 1.9/ 2
   CO2 BACKGRD PERCENT                             .07
   NOX SAMPLE  METER READING/SCALE                65.2/ 2
   NOX SAMPLE  PPM                                65.2
   NOX BACKGRD METER READING/SCALE                 1.7/ 2
   NOX BACKGRD PPM                                 1.7
   HC  CONCENTRATION PPM                            4
   CO  CONCENTRATION PPM                           58
   CO2 CONCENTRATION PCT                          1.82
   NOX CONCENTRATION PPM                          63.7
   SO2 COCENTRATION PPM                           0.0
   HC  MASS (GRAMS)                                .49
   CO  MASS (GRAMS)                              14.03
   CO2 MASS (GRAMS)                            6866.11
   NOX MASS (GRAMS)                              21.85
   SO2 MASS (GRAMS)                               0.00

HC   GRAMS/KM (GRAMS/MILE)        .02 (   .04)
CO   GRAMS/KM (GRAMS/MILE)        .65 (  1.04)
CO2  GRAMS/KM (GRAMS/MILE)        317 (   511)
NOX  GRAMS/KM (GRAMS/MILE)       1.01 (  1.63)
SO2  GRAMS/KM (GRAMS/MILE)       0.00 (  0.00)

HC   GRAMS/KG OF FUEL    .22     HC   GRAMS/MIN    .02
CO   GRAMS/KG OF FUEL    6.5     CO   GRAMS/MIN    .6
CO2  GRAMS/KG OF FUEL   3159     CO2  GRAMS/MIN    295
NOX  GRAMS/KG OF FUEL  10.05     NOX  GRAMS/MIN    .94
SO2  GRAMS/KG OF FUEL   0.00     SO2  GRAMS/MIN   0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      13.60 ( 17.30)

TOTAL CVS FLOW=   206.5STD. CU. METRES
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      TABLE       EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER EM8

DATE  5/ 2/78              TIME    -0 HRS.         TEST NO.  2
MODEL  1977 PLY FURY       SET-7                   ENGINE 5.9 LITREO
RUN DURATION   23.30 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  250.18 ACT. CU. METRES

                                SAMPLE                BACKGROUND
SULFATE DATA                    ------                ----------

 FILTER NO.                  47FH-2929
 SAMPLE VOL. CU. FT.            17.48                     1.00
 SAMPLE TEMP. DEG. F               78                       70
 SAMPLE AREA SQ. IN.         44869.00                     0.00
 DILUTION FACTOR                    1                        1
 STAND. DEN. MICROG/ML           5.00                     1.00
 STAND. AREA SQ. IN.        151493.00                     1.00
 SO4,MICROG/FILTER             14.809                    0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.             1.00                     1.00
 SAMPLE TEMP. DEG. F               70                       70
 AREA,BUBBLER 1                  0.00                     0.00
 DIL. FACT.,BUBBLER 1               1                        1
 AREA,BUBBLER 2                  0.00                     0.00
 DIL. FACT.,BUBBLER 2               1                        1
 STAND. DEN. MICROG/ML           1.00                     1.00
 STAND. AREA,SQ. IN.             1.00                     1.00
 SO2, MILLIG/BUBBLER 1          0.000                    0.000
 SO2, MILLIG/BUBBLER 2          0.000                    0.000
 SO2, PPM                         0.0                      0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST                8.590
 NET H2SO4,MILLIGRAM/TEST                  8.770
 NET SO2,GRAM/TEST                         0.000
 NET SULFATE,MILLIGRAM/KILOMETRE            .395
 NET H2SO4,MILLIGRAM/KILOMETRE              .403
 NET SO2,GRAM/KILOMETRE                    0.000

SULFUR BALANCE
 FUEL WT., 2183 GRAMS      SULFUR IN FUEL, .0310 PCT.
                             FUEL      SO2      H2SO4        SO2 + H2SO4
                             ----     -----    -------       -----------
          SULFUR,GRAMS        .68     0.000      .0029             .0029
          PCT. RECOVERY               0.00        .42               .42
      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                            VEHICLE NUMBER EM8

 DATE  5/ 3/78                TIME     -0 HRS.        TEST NO.  3
 MODEL  1977 PLY FURY         HFET                    ENGINE 5.9 LITREV 8
 DRIVER   JC                  TEST WT.  2041 KG.      GVW    0 KG
 WET BULB TEMP  14 C          DRY BULB TEMP  26 C     REL. HUM.  28.0 PCT
 SPEC. HUM.   5.9 GRAM/KG     BARO.  732.8 MM  HG.    MEASURED FUEL  0.00 KG
 DISTANCE  16.354 KM            FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

  RUN DURATION            12.76 MINUTES
  BLOWER INLET PRESS.      749.3  MM. H20
  BLOWER DIF.  PRESS.      749.3  MM  H20
  BLOWER INLET TEMP.         43  DEG. C
  DYNO REVOLUTIONS       23767
  BLOWER REVOLUTIONS       61427
  BLOWER CU. CM /REV.    2226

  BAG RESULTS
   HC   SAMPLE  METER READING/SCALE                    18.0/ 2
   HC   SAMPLE  PPM                                      18
   HC   BACKGRD METER READING/SCALE                    12.5/ 2
   HC   BACKGRD PPM                                      13
   CO   SAMPLE  METER READING/SCALE                    50.1/12
   CO   SAMPLE  PPM                                     110
   CO   BACKGRD METER READING/SCALE                     2.4/12
   CO   BACKGRD PPM                                       4
   CO2  SAMPLE  METER READING/SCALE                    48.9/ 2
   CO2  SAMPLE  PERCENT                                2.22
   CO2  BACKGRD METER READING/SCALE                     1.5/ 2
   CO2  BACKGRD PERCENT                                 .05
   NOX  SAMPLE  METER READING/SCALE                    85.6/ 2
   NOX  SAMPLE  PPM                                    85.6
   NOX  BACKGRD METER READING/SCALE                     1.3/ 2
   NOX  BACKGRD PPM                                     1.3
   HC   CONCENTRATION PPM                                 8
   CO   CONCENTRATION PPM                               101
   CO2  CONCENTRATION PCT                              2.18
   NOX  CONCENTRATION PPM                              84.5
   SO2  COCENTRATION PPM                               0.0
   HC   MASS (GRAMS)                                    .49
   CO   MASS (GRAMS)                                  13.32
   CO2  MASS (GRAMS)                                4498.32
   NOX  MASS (GRAMS)                                  15.75
   SO2  MASS (GRAMS)                                   0.00

 HC   GRAMS/KM (GRAMS/MILE)          .03 (   .05)
 CO   GRAMS/KM (GRAMS/MILE)          .81 (  1.31)
 CO2  GRAMS/KM (GRAMS/MILE)          275 (   443)
 NOX  GRAMS/KM (GRAMS/MILE)          .96 (  1.55)
 SO2  GRAMS/KM (GRAMS/MILE)         0.00 (  0.00)

 HC   GRAMS/KG OF FUEL     .35      HC   GRAMS/MIN    .04
 CO   GRAMS/KG OF FUEL     9.3      CO   GRAMS/MIN    1.0
 CO2  GRAMS/KG OF FUEL    3154      CO2  GRAMS/MIN    353
 NOX  GRAMS/KG OF FUEL   11.04      NOX  GRAMS/MIN   1.23
 SO2  GRAMS/KG OF FUEL    0.00      SO2  GRAMS/MIN   0.00

 CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      11.80 ( 19.94)

 TOTAL CVS FLOW=   113.0STD. CU. METRES
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                    TABLE                       VEHICLE EMISSION RESULTS
                                              1978  LIGHT DUTY EMISSIONS TEST
                                           ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM8       TEST NO.     1        DATE  5/ 8/78                    MFGR. CODE   -0                 YR.  1977
VEHICLE MODEL  PLYMOUTH FURY              ENGINE   5.90 LITRE 8            CURB WT.     0 KG               GVM     0 KG

BAROMETER 738.12 MM OF HG.                                           WET BULB TEMP  13.9 DEG. C
DRY BULB TEMP.    23.9 DEG. C                                         ABS. HUMIDITY   5.9 GRAMS/KG
REL. HUMIDITY      31 PCT.                                            COMMENTS  1978  FTPC

EXHAUST EMISSIONS
                                                                     BLOWER INLET PRESS., G1 736.6 MM. H2O
     BLOWER DIF. PRESS., G2, 736.6 MM. H2O                           BLOWER INLET TEMP.   43 DEG. C
     BAG RESULTS
     BAG NO.                                       1                 2                 3
     BLOWER REVOLUTIONS                          40689             69614             40539
     HC    SAMPLE  METFR READING/SCALE            95.2/ 2           13.1/ 2           18.2/ 2
     HC    SAMPLE  PPM                            95                13                18
     HC    BACKGRD METER READING/SCALE            10.9/ 2           10.3/ 2            9.9/ 2
     HC    BACKGRD PPM                            11                10                10
     CO    SAMPLE  METER READING/SCALE            26.7/ 3           42.2/13           60.0/12
     CO    SAMPLE  PPM                           620                40               134
     CO    BACKGRD METER READING/SCALE              .1/ 3             .5/13             .4/12
     CO    BACKGRD PPM                             2                 0                 1
     CO2   SAMPLE  METER READING/SCALE            42.5/ 2           66.9/ 3           89.6/ 3
     CO2   SAMPLE  PERCENT                       1.87              1.20              1.67
     CO2   BACKGRD METER READING/SCALE             1.6/ 2            3.0/ 3            2.4/ 3
     CO2   BACKGRD PERCENT                        .06               .05               .04
     NOX   SAMPLE  METER READING/SCALE            54.9/ 2           31.0/ 2           51.9/ 2
     NOX   SAMPLE  PPM                           54.9              31.0              51.9
     NOX   BACKGRD METER READING/SCALE              .7/ 2             .7/ 2             .9/ 2
     NOX   BACKGRD PPM                             .7                .7                .9
     SO2   SAMPLE  METER READING/SCALE          -0.0/-0           -0.0/-0           -0.0/-0
     SO2   SAMPLF  PPM                          -0.0              -0.0              -0.0
     SO2   BACKGRD METER READING/SCALE          -0.0/-0           -0.0/-0           -0.0/-0
     SO2   BACKGRD PPM                          -0.0              -0.0              -0.0

     HC    CONCENTRATION PPM                      86                 4                10
     CO    CONCENTRATION PPM                     590                38               128
     CO2   CONCENTRATION PCT                    1.82              1.16              1.64
     NOX   CONCENTRATION PPM                    54.3              30.4              51.1
     SO2   CONCENTRATION PPM                     0.0               0.0               0.0
     HC    MASS GRAMS                           3.74               .28               .41
     CO    MASS GRAMS                          51.86              5.75             11.18
     CO2   MASS GRAMS                        2518.11           2742.06           2255.50
     NOX   MASS GRAMS                           6.77              6.48              6.35
     SO2   MASS GRAMS                           0.00              0.00              0.00
     HC GRAMS/KM (GRAMS/MILE)                    .65 (  1.05)      .04 (   .07)      .07 (   .11)
     CO GRAMS/KM (GRAMS/MILE)                   9.01 ( 14.50)      .92 (  1.49)     1.93 (  3.10)
     CO2 GRAMS/KM (GRAMS/MILE)                437.69 (704.24)   440.72 (709.12)   388.51 (625.12)
     NOX GRAMS/KM (GRAMS/MILE)                  1.18 (  1.89)     1.04 (  1.67)     1.09 (  1.76)
     FUEL CONSUMPTION BY CB  L/100KM (MPG)     19.37 ( 12.14)    18.88 ( 12.46)    16.72 ( 14.07)
     CVS FLOW STD. CU. METRES (SCF)             75.5 (2666.3)    129.1 (4560.9)     75.2 (2656.0)
     CALCULATED DISTANCE KM(MILES)              5.75 (  3.58)     6.22 (  3.87)     5.81 (  3.61)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)         18.39 ( 12.79)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)                 .18 (   .28)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)                2.87 (  4.62)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)             425.73 (685.00)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)               1.08 (  1.74)
    TOTAL CVS FLOW =    279.9 STD. CU. METRES
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        TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EM8

DATE   5/ 8/78                TIME     -0 HRS.        TEST NO.  1
MODEL  1977 PLY FURY          SET-7                   ENGINE 5.9 LITRE  8
DRIVER   TJ                   TEST WT.  2041 KG.      GVW    0 KG
WET BULB TEMP  16 C           DRY BULB TEMP  28 C     REL. HUM.  28.4 PCT
SPEC. HUM.   6.8 GRAM/KG      BARO.  737.6 MM  HG.    MEASURED FUEL  0.00 KG
DISTANCE  21.791 KM             FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

 RUN DURATION          23.28 MINUTES
 BLOWER INLET PRESS.    762.0  MM. H20
 BLOWER DIF.  PRESS.    762.0  MM  H20
 BLOWER INLET TEMP.      43  DEG. C
 DYNO REVOLUTIONS     31668
 BLOWER REVOLUTIONS    112172
 BLOWER CU. CM /REV.   2227

 BAG RESULTS
  HC   SAMPLE  METER READING/SCALE               16.0/ 2
  HC   SAMPLE  PPM                                16
  HC   BACKGRD METER READING/SCALE               12.3/ 2
  HC   BACKGRD PPM                                12
  CO   SAMPLE  METER READING/SCALE               53.6/12
  CO   SAMPLE  PPM                               119
  CO   BACKGRD METER READING/SCALE                1.4/12
  CO   BACKGRD PPM                                 2
  CO2 SAMPLE  METER READING/SCALE                43.0/ 2
  CO2 SAMPLE  PERCENT                            1.90
  CO2 BACKGRD METER READING/SCALE                 1.6/ 2
  CO2 BACKGRD PERCENT                             .06
  NOX SAMPLE  METER READING/SCALE                56.6/ 2
  NOX SAMPLE  PPM                                56.6
  NOX BACKGRD METER READING/SCALE                 1.1/ 2
  NOX BACKGRD PPM                                1.1
  HC   CONCENTRATION PPM                            5
  CO   CONCENTRATION PPM                          111
  CO2 CONCENTRATION PCT                          1.85
  NOX CONCENTRATION PPM                          55.7
  SO2 COCENTRATION PPM                           0.0
  HC   MASS (GRAMS)                               .65
  CO   MASS (GRAMS)                             26.84
  CO2 MASS (GRAMS)                            7010.24
  NOX MASS (GRAMS)                              19.52
  SO2 MASS (GRAMS)                               0.00

HC   GRAMS/KM (GRAMS/MILE)       .03 (   .05)
CO   GRAMS/KM (GRAMS/MILE)      1.23 (  1.98)
CO2 GRAMS/KM (GRAMS/MILE)        322 (   518)
NOX GRAMS/KM (GRAMS/MILE)        .90 (  1.44)
SO2 GRAMS/KM (GRAMS/MILE)       0.00 (  0.00)

HC   GRAMS/KG OF FUEL    .29     HC   GRAMS/MIN    .03
CO   GRAMS/KG OF FUEL   12.1     CO   GRAMS/MIN    1.2
CO2 GRAMS/KG OF FUEL    3149     CO2 GRAMS/MIN     301
NOX GRAMS/KG OF FUEL    8.77     NOX GRAMS/MIN     .84
SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN    0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      13.82 ( 17.02)

TOTAL CVS FLOW=   207.3STD. CU. METRES
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TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                       VEHICLE NUMBER EM8

DATE  5/ 8/78              TIME    -0 HRS.        TEST NO.  1
MODEL  1977 PLY FURY       SET-7                  ENGINE 5.9 LITREO
RUN DURATION   23.28 MIN.  DISTANCE DRIVEN  21.74 KILOMETRES
CVS BLOWER TEST VOL.  249.83 ACT. CU. METRES

                               SAMPLE                 BACKGROUND
SULFATE DATA                   ------                 ----------

 FILTER NO.                  47FH-2932
 SAMPLE VOL. CU. FT.           17.11                    1.00
 SAMPLE TEMP. DEG. F              88                      70
 SAMPLE AREA SQ. IN.        50406.00                    0.00
 DILUTION FACTOR                   1                       1
 STAND. DEN. MICROG/ML          5.00                    1.00
 STAND. AREA SQ. IN.       164372.00                    1.00
 SO4,MICROG/FILTER            15.333                   0.000

SULFUR DIOXIDE DATA

 SAMPLE VOL. CU. FT.            1.00                    1.00
 SAMPLE TEMP. DEG. F              70                      70
 AREA,BUBBLER 1                 0.00                    0.00
 DIL. FACT.,BUBBLER 1              1                       1
 AREA,BUBBLER 2                 0.00                    0.00
 DIL. FACT.,BUBBLER 2              1                       1
 STAND. DEN. MICROG/ML          1.00                    1.00
 STAND. AREA,SQ. IN.            1.00                    1.00
 SO2, MILLIG/BUBBLER 1         0.000                   0.000
 SO2, MILLIG/BUBBLER 2         0.000                   0.000
 SO2, PPM                        0.0                     0.0

SULFATE AND SO2 EMISSIONS

 NET SULFATE,MILLIGRAM/TEST              8.918
 NET H2SO4,MILLIGRAM/TEST                9.106
 NET SO2,GRAM/TEST                       0.000
 NET SULFATE,MILLIGRAM/KILOMETRE          .410
 NET H2SO4,MILLIGRAM/KILOMETRE            .419
 NET SO2,GRAM/KILOMETRE                  0.000

SULFUR BALANCE
 FUEL WT., 2235 GRAMS      SULFUR IN FUEL, .0310 PCT.
                             FUEL     SO2       H2SO4        SO2 + H2SO4
                             ----    -----     -------      -----------
          SULFUR,GRAMS        .69    0.000       .0030            .0030
          PCT. RECOVERY              0.00         .43              .43
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        TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                              VEHICLE NUMBER EM8

      DATE  5/ 8/78              TIME     -0 HRS.        TEST NO.  1
      MODEL  1977 PLY FURY       FET                     ENGINE 5.9 LITRE  8
      DRIVER   TJ                TEST WT.  2041 KG.      GVW    0 KG
      WET BULB TEMP  16 C        DRY BULB TEMP  29 C     REL. HUM.  24.8 PCT
      SPEC. HUM.   6.3 GRAM/KG   BARO.  737.6 MM  HG.    MEASURED FUEL  0.00 KG
      DISTANCE  16.469 KM          FUEL 738.2 G/LITRE    FUEL HC  RATIO 1.860

        RUN DURATION           12.76 MINUTES
        BLOWER INLET PRESS.    762.0  MM. H2O
        BLOWER DIF.  PRESS.    762.0  MM  H2O
        BLOWER INLET TEMP.       43  DEG. C
        DYNO REVOLUTIONS      23934
        BLOWER REVOLUTIONS     61571
        BLOWER CU. CM /REV.   2226

        BAG RESULTS
         HC   SAMPLE  METER READING/SCALE              16.1/ 2
         HC   SAMPLE  PPM                               16
         HC   BACKGRD METER READING/SCALE              11.8/ 2
         HC   BACKGRD PPM                               12
         CO   SAMPLE  METER READING/SCALE              52.0/12
         CO   SAMPLE  PPM                               115
         CO   BACKGRD METER READING/SCALE               .8/12
         CO   BACKGRD PPM                                1
         CO2 SAMPLE  METER READING/SCALE               48.2/ 2
         CO2 SAMPLE  PERCENT                           2.18
         CO2 BACKGRD METER READING/SCALE                1.3/ 2
         CO2 BACKGRD PERCENT                            .05
         NOX SAMPLE  METER READING/SCALE               68.1/ 2
         NOX SAMPLE  PPM                               68.1
         NOX BACKGRD METER READING/SCALE                1.0/ 2
         NOX BACKGRD PPM                                1.0
         HC   CONCENTRATION PPM                          6
         CO   CONCENTRATION PPM                         108
         CO2 CONCENTRATION PCT                          2.14
         NOX CONCENTRATION PPM                          67.3
         SO2 COCENTRATION PPM                           0.0
         HC   MASS (GRAMS)                              .41
         CO   MASS (GRAMS)                             14.32
         CO2 MASS (GRAMS)                            4464.73
         NOX MASS (GRAMS)                              12.78
         SO2 MASS (GRAMS)                               0.00

      HC   GRAMS/KM (GRAMS/MILE)        .02 (   .04)
      CO   GRAMS/KM (GRAMS/MILE)        .87 (  1.40)
      CO2 GRAMS/KM (GRAMS/MILE)        271 (   436)
      NOX GRAMS/KM (GRAMS/MILE)        .78 (  1.25)
      SO2 GRAMS/KM (GRAMS/MILE)       0.00 (  0.00)

      HC   GRAMS/KG OF FUEL     .24     HC   GRAMS/MIN    .03
      CO   GRAMS/KG OF FUEL    10.1     CO   GRAMS/MIN    1.1
      CO2 GRAMS/KG OF FUEL    3153     CO2 GRAMS/MIN    350
      NOX GRAMS/KG OF FUEL    9.03     NOX GRAMS/MIN   1.00
      SO2 GRAMS/KG OF FUEL    0.00     SO2 GRAMS/MIN   0.00

      CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      11.63 ( 20.22)

      TOTAL CVS FLOW=   113.9STD. CU. METRES
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                           TABLE                         VEHICLE EMISSION RESULTS
                                                       1978  LIGHT DUTY EMISSIONS TEST
                                                    ACTUAL DISTANCES USED IN CALCULATIONS
UNIT NO.  EM8       TEST NO.      1       DATE  5/29/78                    MFGR. CODE   -0                 YR.  1977
VEHICLE MODEL  PLYMOUTH FURY              ENGINE    5.90 LITRE 8           CURB WT.      0 KG              GVM      0 KG

BAROMETER 740.16 MM OF HG.
DRY BULB TEMP.     25.6 DEG. C                                             WET BULB TEMP  18.9 DEG. C
REL. HUMIDITY       53 PCT.                                                 ABS. HUMIDITY  11.1 GRAMS/KG
                                                                            COMMENTS  1978 FTPC
EXHAUST EMISSIONS

    BLOWER DIF. PRESS., G2, 736.6 MM. H2O                                  BLOWER INLET PRESS., G1 736.6 MM. H2O
    BAG RESULTS                                                            BLOWER INLET TEMP.    43 DEG. C
    BAG NO.                                    1             2             3
    BLOWER REVOLUTIONS                      40598         69661         40609
    HC    SAMPLE  METER READING/SCALE        9.9/ 3        17.7/ 2       33.6/ 2
    HC    SAMPLE  PPM                       99            18             34
    HC    BACKGRD METER READING/SCALE        1.5/ 3        13.0/ 2       14.6/ 2
    HC    BACKGRD PPM                       15            13             15
    CO    SAMPLE  METER READING/SCALE       42.8/ 3        60.0/12       97.7/12
    CO    SAMPLE  PPM                     1028            134            245
    CO    BACKGRD METER READING/SCALE        .1/ 3         2.4/12        1.9/12
    CO    BACKGRD PPM                        2              4              3
    CO2   SAMPLE  METER READING/SCALE       93.5/ 3        68.1/ 3       86.2/ 3
    CO2   SAMPLE  PERCENT                  1.75           1.23           1.60
    CO2   BACKGRD METER READING/SCALE        3.9/ 3         4.3/ 3        2.7/ 3
    CO2   BACKGRD PERCENT                   .06            .07            .04
    NOX   SAMPLE  METER READING/SCALE       31.8/ 2        15.7/ 2       48.2/ 2
    NOX   SAMPLE  PPM                      31.8           15.7           48.2
    NOX   BACKGRD METER READING/SCALE        1.0/ 2          .5/ 2        1.2/ 2
    NOX   BACKGRD PPM                       1.0             .5            1.2
    SO2   SAMPLE  METER READING/SCALE      -0.0/-0        -0.0/-0        -0.0/-0
    SO2   SAMPLE  PPM                      -0.0           -0.0           -0.0
    SO2   BACKGRD METER READING/SCALE      -0.0/-0        -0.0/-0        -0.0/-0
    SO2   BACKGRD PPM                      -0.0           -0.0           -0.0

    HC    CONCENTRATION PPM                 86              6             21
    CO    CONCENTRATION PPM                974            125            231
    CO2   CONCENTRATION PCT                1.70           1.17           1.56
    NOX   CONCENTRATION PPM                30.9           15.2           47.1
    SO2   CONCENTRATION PPM                 0.0            0.0            0.0
    HC    MASS GRAMS                       3.75            .44            .91
    CO    MASS GRAMS                      85.75          18.85          20.33
    CO2   MASS GRAMS                    2354.49        2769.59        2164.37
    NOX   MASS GRAMS                       4.54           3.84           6.92
    SO2   MASS GRAMS                       0.00           0.00           0.00
    HC GRAMS/KM (GRAMS/MILE)               .65 (  1.05)    .07 (   .12)    .16 (   .25)
    CO GRAMS/KM (GRAMS/MILE)             14.87 ( 23.92)   3.08 (  4.95)   3.55 (  5.71)
    CO2 GRAMS/KM (GRAMS/MILE)           408.27 (656.91) 452.50 (728.07) 377.92 (608.08)
    NOX GRAMS/KM (GRAMS/MILE)              .79 (  1.27)    .63 (  1.01)   1.21 (  1.94)
    FUEL CONSUMPTION BY CB  L/100KM (MPG) 18.51 ( 12.71)  19.53 ( 12.05)  16.39 ( 14.35)
    CVS FLOW STD. CU. METRES (SCF)        75.6 (2670.9)  129.8 (4582.5)   75.7 (2671.6)
    CALCULATED DISTANCE KM(MILES)         5.77 (  3.58)   6.12 (  3.80)   5.73 (  3.56)

WEIGHTED FUEL CONSUMPTION LITRES/100KM (MPG)      18.45 ( 12.75)
WEIGHTED MASS HC GRAMS/KM (GRAMS/MILE)              .22 (   .35)
WEIGHTED MASS CO GRAMS/KM (GRAMS/MILE)             5.67 (  9.12)
WEIGHTED MASS CO2 GRAMS/KM (GRAMS/MILE)          422.73 (680.17)
WEIGHTED MASS NOX GRAMS/KM (GRAMS/MILE)             .82 (  1.32)
    TOTAL CVS FLOW =    281.1 STD. CU. METRES
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      TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                             VEHICLE NUMBER EM8

DATE  5/29/78              TIME     -0 HRS.         TEST NO.  2
MODEL  1977 PLYMOUTH FURY  SET-7                    ENGINE 5.9 LITREV 8
DRIVER   TJ                TEST WT.  2041 KG.       GVW    0 KG
WET BULB TEMP  17 C        DRY BULB TEMP  24 C      REL. HUM.  45.0 PCT
SPEC. HUM.   8.8 GRAM/KG   BARO.  740.2 MM  HG.     MEASURED FUEL  0.00 KG
DISTANCE  21.652 KM          FUEL 738.2 G/LITRE     FUEL HC  RATIO 1.860

 RUN DURATION            23.29 MINUTES
 BLOWER INLET PRESS.      762.0  MM. H2O
 BLOWER DIF.  PRESS.      762.0  MM  H2O
 BLOWER INLET TEMP.        43  DEG. C
 DYNO REVOLUTIONS      31466
 BLOWER REVOLUTIONS    112256
 BLOWER CU. CM /REV.   2226

 BAG RESULTS
  HC   SAMPLE  METER READING/SCALE                 19.2/ 2
  HC   SAMPLE  PPM                                   19
  HC   BACKGHD METER READING/SCALE                 14.4/ 2
  HC   BACKGRD PPM                                   14
  CO   SAMPLE  METER READING/SCALE                 78.4/12
  CO   SAMPLE  PPM                                  180
  CO   BACKGRD METER READING/SCALE                  2.5/12
  CO   BACKGRD PPM                                    4
  CO2 SAMPLE  METER READING/SCALE                  92.3/ 3
  CO2 SAMPLE  PERCENT                              1.73
  CO2 BACKGRD METER READING/SCALE                   3.6/ 3
  CO2 BACKGRD PERCENT                               .06
  NOX SAMPLE  METER READING/SCALE                  54.6/ 2
  NOX SAMPLE  PPM                                  54.6
  NOX BACKGRD METER READING/SCALE                   1.6/ 2
  NOX BACKGRD PPM                                   1.6
  HC   CONCENTRATION PPM                              7
  CO   CONCENTRATION PPM                            168
  CO2 CONCENTRATION PCT                            1.68
  NOX CONCENTRATION PPM                            53.2
  SO2 COCENTRATION PPM                             0.0
  HC   MASS (GRAMS)                                 .80
  CO   MASS (GRAMS)                               40.75
  CO2 MASS (GRAMS)                              6402.92
  NOX MASS (GRAMS)                                19.95
  SO2 MASS (GRAMS)                                 0.00

HC   GRAMS/KM (GRAMS/MILE)          .04 (   .06)
CO   GRAMS/KM (GRAMS/MILE)         1.88 (  3.03)
CO2 GRAMS/KM (GRAMS/MILE)          296 (   476)
NOX GRAMS/KM (GRAMS/MILE)           .92 (  1.48)
SO2 GRAMS/KM (GRAMS/MILE)          0.00 (  0.00)

HC   GRAMS/KG OF FUEL     .39     HC   GRAMS/MIN    .03
CO   GRAMS/KG OF FUEL    20.0     CO   GRAMS/MIN    1.7
CO2 GRAMS/KG OF FUEL     3137     CO2 GRAMS/MIN    275
NOX GRAMS/KG OF FUEL     9.77     NOX GRAMS/MIN    .86
SO2 GRAMS/KG OF FUEL     0.00     SO2 GRAMS/MIN   0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      12.75 ( 18.45)

TOTAL CVS FLOW=   208.5STD. CU. METRES
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TABLE        EXHAUST EMISSIONS FROM SINGLE BAG SAMPLE
                     VEHICLE NUMBER EMR

DATE  5/29/78                     TIME     -0 HRS.          TEST NO.  3
MODEL  1977 PLYMOUTH FURY         H-FET                     ENGINE 5.9 LITREV 8
DRIVER   TJ                       TEST WT.  2041 KG.        GVW    0 KG
WET BULB TEMP  16 C               DRY BULB TEMP  24 C       REL. HUM.  41.7 PCT
SPEC. HUM.   8.1 GRAM/KG          BARO.  740.4 MM  HG.      MEASURED FUEL  0.00 KG
DISTANCE  16.340 KM                 FUEL 738.2 G/LITRE      FUEL HC  RATIO 1.860

 RUN DURATION              12.76 MINUTES
 BLOWER INLET PRESS.        762.0  MM. H2O
 BLOWER DIF.  PRESS.        762.0  MM  H2O
 BLOWER INLET TEMP.           43  DEG. C
 DYNO REVOLUTIONS          23747
 BLOWER REVOLUTIONS          61501
 BLOWER CU. CM /REV.       2226

 BAG RESULTS
  HC   SAMPLE   METER READING/SCALE                   18.2/ 2
  HC   SAMPLE  PPM                                       18
  HC   BACKGRD METER READING/SCALE                    12.6/ 2
  HC   BACKGRD PPM                                       13
  CO   SAMPLE   METER READING/SCALE                   81.5/12
  CO   SAMPLE  PPM                                       189
  CO   BACKGRD METER READING/SCALE                     1.4/12
  CO   BACKGRD PPM                                        2
  CO2  SAMPLE   METER READING/SCALE                   46.8/ 2
  CO2  SAMPLE  PERCENT                                2.10
  CO2  BACKGRD METER READING/SCALE                     1.6/ 2
  CO2  BACKGRD PERCENT                                  .06
  NOX  SAMPLE   METER READING/SCALE                   79.1/ 2
  NOX  SAMPLE  PPM                                    79.1
  NOX  BACKGRD METER READING/SCALE                     1.1/ 2
  NOX  BACKGRD PPM                                      1.1
  HC   CONCENTRATION PPM                                  8
  CO   CONCENTRATION PPM                                177
  CO2  CONCENTRATION PCT                               2.05
  NOX  CONCENTRATION PPM                               78.2
  SO2  COCENTRATION PPM                                 0.0
  HC   MASS (GRAMS)                                     .50
  CO   MASS (GRAMS)                                   23.52
  CO2  MASS (GRAMS)                                 4296.21
  NOX  MASS (GRAMS)                                   15.74
  SO2  MASS (GRAMS)                                    0.00

HC   GRAMS/KM (GRAMS/MILE)          .03 (   .05)
CO   GRAMS/KM (GRAMS/MILE)         1.44 (  2.32)
CO2  GRAMS/KM (GRAMS/MILE)          263 (   423)
NOX  GRAMS/KM (GRAMS/MILE)          .96 (  1.55)
SO2  GRAMS/KM (GRAMS/MILE)         0.00 (  0.00)

HC   GRAMS/KG OF FUEL     .37     HC   GRAMS/MIN     .04
CO   GRAMS/KG OF FUEL    17.2     CO   GRAMS/MIN     1.8
CO2  GRAMS/KG OF FUEL    3141     CO2  GRAMS/MIN     337
NOX  GRAMS/KG OF FUEL   11.51     NOX  GRAMS/MIN    1.23
SO2  GRAMS/KG OF FUEL    0.00     SO2  GRAMS/MIN    0.00

CARBON BALANCE FUEL ECONOMY L/100KM (MILES/GALLON)      11.32 ( 20.78)

TOTAL CVS FLOW=   114.3STD. CU. METRES
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                          TABLE      VEHICLE EMISSION RESULTS
                                             FTP                                      PROJECT NO. 11-4746-001

VEHICLE NO.  EMB                              TEST NO.5-2    RUN 1                TEST WEIGHT   2045 KG(  4500 LBS)
VEHICLE MODEL    77 FURY                      DATE  6/ 1/78                       ACTUAL ROAD LOAD  10.4 KW( 14.0 HP)
ENGINE 5.9 L(360 CID) V-8                     TIME 09:32                          GASOLINE
TRANSMISSION A3                               DYNO NO.  3                         ODOMETER   25584
GVW      0 KG(    -0 LBS)                     CVS NO.   2
                                              BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)           RELATIVE HUMIDITY 56 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)         ABSOLUTE HUMIDITY 11.4 GM/KG( 79.9 GRAINS/LB)      NOX HUMIDITY C.F. 1.0234

BAG RESULTS
   BAG NUMBER                                    1                  2                 3
   DESCRIPTION                             COLD TRANSIENT      STABILIZED       HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)           762.0 (30.0)       762.0 (30.0)      762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)         762.0 (30.0)       762.0 (30.0)      762.0 (30.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)        43.9 (111.0)       43.3 (110.0)      43.3 (110.0)
   BLOWER REVOLUTIONS                         40621              69653             40605
   CVS FLOW STD. CU. METRES(SCF)            75.2 (2656.0)     129.1 (4558.1)     75.2 (2657.3)

   HC  SAMPLE METER/RANGE/PPM              14.0/ 3/  140      20.3/ 2/   20     24.8/ 2/   25
   HC  BCKGRD METER/RANGE/PPM               1.9/ 3/   19      18.6/ 2/   19     16.1/ 2/   16
   CO  SAMPLE METER/RANGE/PPM              26.1/ 3/  606      59.1/12/  132     73.9/12/  168
   CO  BCKGRD METER/RANGE/PPM                .3/ 3/    7       4.9/12/    9       .9/12/    2
   CO2 SAMPLE METER/RANGE/PCT              48.6/ 2/ 2.20      83.8/ 3/ 1.55     43.6/ 2/ 1.93
   CO2 BCKGRD METER/RANGE/PCT               1.9/ 2/  .07       3.9/ 3/  .06      1.3/ 2/  .05
   NOX SAMPLE METER/RANGE/PPM              53.6/ 2/   54      37.2/ 2/   37     50.9/ 2/   51
   NOX BCKGRD METER/RANGE/PPM               1.5/ 2/    2        .6/ 2/    1       .6/ 2/    1

   DILUTION FACTOR                             5.89               8.57              6.08
   HC  CONCENTRATION PPM                       124                 9                11
   CO  CONCENTRATION PPM                       564               118               158
   CO2 CONCENTRATION PCT                       2.15               1.50              1.89
   NOX CONCENTRATION PPM                       52.4               36.7              50.4

   HC  MASS GRAMS                              5.39                .29               .48
   CO  MASS GRAMS                             49.36              17.72             13.82
   CO2 MASS GRAMS                            2955.9             3535.1            2603.3
   NOX MASS GRAMS                              7.71               9.26              7.42

   HC  GRAMS/KM (GRAMS/MILE)                .94 (  1.50)       .05 (   .07)      .08 (   .14)
   CO  GRAMS/KM (GRAMS/MILE)               8.57 ( 13.78)      2.82 (  4.54)     2.43 (  3.91)
   CO2 GRAMS/KM (GRAMS/MILE)              513.0 ( 825.4)     562.5 ( 905.1)    458.1 ( 737.2)
   NOX GRAMS/KM (GRAMS/MILE)               1.34 (  2.15)      1.47 (  2.37)     1.31 (  2.10)
   FUEL CONSUMPTION BY CB L/100KM(MPG)    22.60 ( 10.41)     24.20 (  9.72)    19.73 ( 11.92)
   CALCULATED DISTANCE KM (MILES)          5.76 (  3.58)      6.28 (  3.91)     5.68 (  3.53)

COMPOSITE FTP RESULTS
   HC  GRAMS/KM (GRAMS/MILE)            .24 (   .38)
   CO  GRAMS/KM (GRAMS/MILE)           3.90 (  6.27)
   CO2 GRAMS/KM (GRAMS/MILE)         524.08 (843.25)
   NOX GRAMS/KM (GRAMS/MILE)           1.40 (  2.25)
   FUEL CONSUMPTION BY CB L/100KM (MPG)   22.66 ( 10.38)
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                         TABLE      VEHICLE EMISSION RESULTS
                                           SET                                  PROJECT NO. 11-4746-001
VEHICLE NO.  EM8                         TEST NO.5-2    RUN 2                TEST WEIGHT   1818 KG(  4000 LBS)
VEHICLE MODEL   77 FURY                  DATE  6/ 1/78                       ACTUAL ROAD LOAD  10.4 KW( 14.0 HP)
ENGINE 5.9 L(360 CID) V-8                TIME 11:36                          GASOLINE
TRANSMISSION A3                          DYNO NO.  3                         ODOMETER   25604
GVW     0 KG(    -0 LBS)                 CVS NO.   2
                                         BAG CART NO.  1

BAROMETER 739.90 MM HG(29.13 IN HG)      RELATIVE HUMIDITY 48 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)    ABSOLUTE HUMIDITY  9.1 GM/KG( 63.5 GRAINS/LB)      NOX HUMIDITY C.F.  .9485

BAG RESULTS
  BAG NUMBER                                   1
  BLOWER DIF P MM. H2O(IN. H2O)          762.0 (30.0)
  BLOWER INLET P MM. H2O(IN. H2O)        762.0 (30.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)       43.3 (110.0)
  BLOWER REVOLUTIONS                       112335
  CVS FLOW STD. CU. METRES(SCF)          208.4 (7359.7)

  HC   SAMPLE METER/RANGE/PPM            19.8/ 2/   20
  HC   BCKGRD METER/RANGE/PPM            16.3/ 2/   16
  CO   SAMPLE METER/RANGE/PPM            78.8/12/  181
  CO   BCKGRD METER/RANGE/PPM              .8/12/    1
  CO2  SAMPLE METER/RANGE/PCT            44.8/ 2/ 1.99
  CO2  BCKGRD METER/RANGE/PCT             1.6/ 2/  .06
  NOX  SAMPLE METER/RANGE/PPM            65.7/ 2/   66
  NOX  BCKGRD METER/RANGE/PPM             1.4/ 2/    1

  DILUTION FACTOR                             6.66
  HC   CONCENTRATION PPM                        6
  CO   CONCENTRATION PPM                      171
  CO2  CONCENTRATION PCT                      1.95
  NOX  CONCENTRATION PPM                      64.5

  HC   MASS GRAMS                              .71
  CO   MASS GRAMS                            41.38
  CO2  MASS GRAMS                           7422.5
  NOX  MASS GRAMS                            24.39

  HC   GRAMS/KM (GRAMS/MILE)              .03 (   .05)
  CO   GRAMS/KM (GRAMS/MILE)             1.87 (  3.02)
  CO2  GRAMS/KM (GRAMS/MILE)            336.3 ( 541.1)
  NOX  GRAMS/KM (GRAMS/MILE)             1.11 (  1.78)
  FUEL CONSUMPTION BY CB L/100KM(MPG)   14.48 ( 16.24)
  CALCULATED DISTANCE KM (MILES)        22.07 ( 13.72)
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                      TABLE      VEHICLE EMISSION RESULTS
                                          HFET                                  PROJECT NO. 11-4746-001

VEHICLE NO.  EM8                               TEST NO.S-2    RUN 3                    TEST WEIGHT   1818 KG(  4000 LBS)
VEHICLE MODEL   77 FURY                        DATE  6/ 1/78                           ACTUAL ROAD LOAD  10.4 KW( 14.0 HP)
ENGINE 5.9 L(360 CID) V-8                      TIME 12:45                              GASOLINE
TRANSMISSION A3                                DYNO NO.  3                             ODOMETER   25628
GVW      0 KG(    -0 LBS)                      CVS NO.   2
                                               BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)            RELATIVE HUMIDITY 45 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)          ABSOLUTE HUMIDITY  8.8 GM/KG( 61.9 GRAINS/LB)      NOX HUMIDITY C.F.  .9419

BAG RESULTS
   BAG NUMBER                                            1
   BLOWER DIF P MM. H2O(IN. H2O)                762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)              762.0 (30.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)             43.3 (110.0)
   BLOWER REVOLUTIONS                               61399
   CVS FLOW STD. CU. METRES(SCF)                113.8 (4017.9)

   HC   SAMPLE METER/RANGE/PPM                  14.1/ 2/    14
   HC   BCKGRD METER/RANGE/PPM                  12.5/ 2/    13
   CO   SAMPLE METER/RANGE/PPM                  70.8/12/   160
   CO   BCKGRD METER/RANGE/PPM                   2.2/12/     4
   CO2  SAMPLE METER/RANGE/PCT                  47.2/ 2/  2.13
   CO2  BCKGRD METER/RANGE/PCT                   1.5/ 2/   .05
   NOX  SAMPLE METER/RANGE/PPM                  64.4/ 2/    64
   NOX  BCKGRD METER/RANGE/PPM                   1.8/ 2/     2

   DILUTION FACTOR                                  6.26
   HC   CONCENTRATION PPM                              4
   CO   CONCENTRATION PPM                            148
   CO2  CONCENTRATION PCT                           2.08
   NOX  CONCENTRATION PPM                           62.9

   HC   MASS GRAMS                                   .24
   CO   MASS GRAMS                                 19.64
   CO2  MASS GRAMS                                4333.4
   NOX  MASS GRAMS                                 12.89

   HC   GRAMS/KM (GRAMS/MILE)                    .01 (   .02)
   CO   GRAMS/KM (GRAMS/MILE)                   1.11 (  1.79)
   CO2  GRAMS/KM (GRAMS/MILE)                  245.6 ( 395.2)
   NOX  GRAMS/KM (GRAMS/MILE)                    .73 (  1.18)
   FUEL CONSUMPTION BY CB L/100KM(MPG)         10.56 ( 22.28)
   CALCULATED DISTANCE KM (MILES)              17.64 ( 10.96)
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APPENDIX F

COMPUTER PRINTOUTS
FOR
AIR MODULATION SYSTEM OPTIMIZATION AND DURABILITY TESTS ON A 1978 VOLVO
(Tests in Chronological Order)

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                              TABLE A-4.  VEHICLE EMISSION RESULTS
                                             FTP
                                                                                   PROJECT NO. 11-4746-001
VEHICLE NO.EM-10                                  TEST NO. 1     RUN 1
VEHICLE MODEL    78 VOLVO EM-10                   DATE  7/27/78                    TEST WEIGHT   1364 KG(  3000 LBS)
ENGINE 2.1 L(130 CID) L-4                         TIME 12:48                       ACTUAL ROAD LOAD   8.4 KW( 11.3 HP)
TRANSMISSION                                      DYNO NO.  3                      GASOLINE EM-274-F
GVW      0 KG(     -0 LBS)                        CVS NO.   2                      ODOMETER       78
                                                  BAG CART NO.  1

BAROMETER 738.89 MM HG(29.09 IN HG)               RELATIVE HUMIDITY 49 PCT
DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)             ABSOLUTE HUMIDITY  8.5 GM/KG( 59.4 GRAINS/LB)     NOX HUMIDITY C.F.  .9316

BAG RESULTS
   BAG NUMBER                                   1                   2                   3
   DESCRIPTION                           COLD TRANSIENT         STABILIZED         HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)          749.3 (29.5)        749.3 (29.5)        749.3 (29.5)
   BLOWER INLET P MM. H2O(IN. H2O)        749.3 (29.5)        749.3 (29.5)        749.3 (29.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)       43.3 (110.0)        42.8 (109.0)        43.3 (110.0)
   BLOWER REVOLUTIONS                        41199               70560               40524
   CVS FLOW STD. CU. METRES(SCF)           76.5 (2700.4)      131.0 (4628.6)       75.2 (2655.9)

   HC   SAMPLE METER/RANGE/PPM            76.2/ 2/   76       20.1/ 2/   20       30.7/ 2/   31
   HC   BCKGRD METER/RANGE/PPM             8.0/ 2/    8        8.4/ 2/    8        8.0/ 2/    8
   CO   SAMPLE METER/RANGE/PPM            24.0/ 3/  555       55.0/12/  122       76.6/12/  175
   CO   BCKGRD METER/RANGE/PPM              .1/ 3/    2        1.3/12/    2        1.5/12/    3
   CO2  SAMPLE METER/RANGE/PCT            77.2/ 3/ 1.41       52.5/ 3/  .92       68.0/ 3/ 1.22
   CO2  BCKGRD METER/RANGE/PCT             3.4/ 3/  .05        4.3/ 3/  .07        3.5/ 3/  .05
   NOX  SAMPLE METER/RANGE/PPM             2.4/ 2/    2         .8/ 2/    1        1.1/ 2/    1
   NOX  BCKGRD METER/RANGE/PPM              .6/ 2/    1         .6/ 2/    1         .7/ 2/    1

   DILUTION FACTOR                           9.10               14.42               10.78
   HC   CONCENTRATION PPM                      69                  12                  23
   CO   CONCENTRATION PPM                     529                 116                 166
   CO2  CONCENTRATION PCT                    1.37                 .85                1.17
   NOX  CONCENTRATION PPM                     1.9                  .2                  .5

   HC   MASS GRAMS                           3.05                 .93                1.02
   CO   MASS GRAMS                          47.12               17.69               14.55
   CO2  MASS GRAMS                         1911.8              2049.6              1617.9
   NOX  MASS GRAMS                            .25                 .06                 .06

   HC   GRAMS/KM (GRAMS/MILE)             .54 (   .86)       .15 (   .25)        .18 (   .29)
   CO   GRAMS/KM (GRAMS/MILE)            8.30 ( 13.36)      2.91 (  4.69)       2.57 (  4.13)
   CO2  GRAMS/KM (GRAMS/MILE)           336.8 ( 541.9)     337.7 ( 543.4)      285.6 ( 459.5)
   NOX  GRAMS/KM (GRAMS/MILE)             .04 (   .07)       .01 (   .01)        .01 (   .02)
   FUEL CONSUMPTION BY CB L/100KM(MPG)  15.01 ( 15.68)     14.63 ( 16.08)      12.38 ( 18.99)
   CALCULATED DISTANCE KM (MILES)        5.68 (  3.53)      6.07 (  3.77)       5.67 (  3.52)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)                .24 (   .39)
   CO   GRAMS/KM (GRAMS/MILE)               3.94 (  6.34)
   CO2  GRAMS/KM (GRAMS/MILE)             323.18 (519.99)
   NOX  GRAMS/KM (GRAMS/MILE)                .02 (   .03)
   FUEL CONSUMPTION BY CB L/100KM (MPG)    14.09 ( 16.70)
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                                        TABLE     VEHICLE EMISSION RESULTS
                                                         SET
                                                                                        PROJECT NO. 11-4746-001
VEHICLE NO.EM-10
VEHICLE MODEL   78 VOLVO EM-10                  TEST NO. 1      RUN 2                TEST WEIGHT   1364 KG(  3000 LBS)
ENGINE 2.1 L(130 CID) L-4                       DATE  7/27/78                        ACTUAL ROAD LOAD    8.4 KW( 11.3 HP)
TRANSMISSION                                    TIME 14:22                           GASOLINE EM-274-F
GVW     0 KG(    -0 LBS)                        DYNO NO.  3                          ODOMETER      113
                                                CVS NO.   2
                                                BAG CART NO.  1

BAROMETER 738.38 MM HG(29.07 IN HG)             RELATIVE HUMIDITY 39 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)           ABSOLUTE HUMIDITY  7.9 GM/KG( 55.6 GRAINS/LB)     NOX HUMIDITY C.F.  .9166

BAG RESULTS
  BAG NUMBER                                        1
  BLOWER DIF P MM. H2O(IN. H2O)                749.3 (29.5)
  BLOWER INLET P MM. H2O(IN. H2O)              749.3 (29.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)             43.3 (110.0)
  BLOWER REVOLUTIONS                              112268
  CVS FLOW STD. CU. METRES(SCF)                208.2 (7352.3)

  HC   SAMPLE METER/RANGE/PPM                  31.6/ 2/   32
  HC   BCKGRD METER/RANGE/PPM                   8.0/ 2/    8
  CO   SAMPLE METER/RANGE/PPM                  95.7/12/  237
  CO   BCKGRD METER/RANGE/PPM                   1.7/12/    3
  CO2  SAMPLE METER/RANGE/PCT                  80.2/ 3/ 1.47
  CO2  BCKGRD METER/RANGE/PCT                   3.5/ 3/  .05
  NOX  SAMPLE METER/RANGE/PPM                   1.8/ 2/    2
  NOX  BCKGRD METER/RANGE/PPM                   1.2/ 2/    1

  DILUTION FACTOR                                  8.43
  HC   CONCENTRATION PPM                            24
  CO   CONCENTRATION PPM                           225
  CO2  CONCENTRATION PCT                          1.43
  NOX  CONCENTRATION PPM                            .7

  HC   MASS GRAMS                                  2.94
  CO   MASS GRAMS                                 54.50
  CO2  MASS GRAMS                                5436.9
  NOX  MASS GRAMS                                   .27

  HC   GRAMS/KM (GRAMS/MILE)                    .14 (   .22)
  CO   GRAMS/KM (GRAMS/MILE)                   2.56 (  4.12)
  CO2  GRAMS/KM (GRAMS/MILE)                  255.7 ( 411.4)
  NOX  GRAMS/KM (GRAMS/MILE)                    .01 (   .02)
  FUEL CONSUMPTION BY CB L/100KM(MPG)         11.10 ( 21.19)
  CALCULATED DISTANCE KM (MILES)              21.27 ( 13.22)
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                                    TABLE      VEHICLE EMISSION RESULTS
                                                         FET                                     PROJECT NO. 11-4746-001

VEHICLE NO.EM-10                                  TEST NO. 1     RUN 3                TEST WEIGHT    1364 KG(  3000 LBS)
VEHICLE MODEL    78 VOLVO EM-10                   DATE  7/27/78                       ACTUAL ROAD LOAD    8.4 KW( 11.3 HP)
ENGINE 2.1 L(130 CID) L-4                         TIME 14:17                          GASOLINE EM-274-F
TRANSMISSION                                      DYNO NO.  3                         ODOMETER      103
GVW      0 KG(    -0 LBS)                         CVS NO.   2
                                                  BAG CART NO.  1

BAROMETER 738.38 MM HG(29.07 IN HG)               RELATIVE HUMIDITY 40 PCT
DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)             ABSOLUTE HUMIDITY  8.4 GM/KG( 58.6 GRAINS/LB)       NOX HUMIDITY C.F.  .4285

BAG RESULTS
   BAG NUMBER                                             1
   BLOWER DIF P MM. H2O(IN. H2O)                  749.3 (29.5)
   BLOWER INLET P MM. H2O(IN. H2O)                749.3 (29.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)               43.3 (110.0)
   BLOWER REVOLUTIONS                                 61581
   CVS FLOW STD. CU. METRES(SCF)                  114.2 (4032.7)

   HC   SAMPLE METER/RANGE/PPM                    35.8/ 2/    36
   HC   BCKGRD METER/RANGE/PPM                     8.2/ 2/     8
   CO   SAMPLE METER/RANGE/PPM                    68.0/11/   286
   CO   BCKGRD METER/RANGE/PPM                     1.0/11/     3
   CO2  SAMPLE METER/RANGE/PCT                    41.2/ 2/  1.80
   CO2  BCKGRD METER/RANGE/PCT                      .8/ 2/   .03
   NOX  SAMPLE METER/RANGE/PPM                     1.0/ 2/     1
   NOX  BCKGRD METER/RANGE/PPM                      .6/ 2/     1

   DILUTION FACTOR                                    7.31
   HC   CONCENTRATION PPM                              29
   CO   CONCENTRATION PPM                             270
   CO2  CONCENTRATION PCT                             1.78
   NOX  CONCENTRATION PPM                              .5

   HC   MASS GRAMS                                    1.89
   CO   MASS GRAMS                                   35.90
   CO2  MASS GRAMS                                  3716.4
   NOX  MASS GRAMS                                     .10

   HC   GRAMS/KM (GRAMS/MILE)                      .11 (    .18)
   CO   GRAMS/KM (GRAMS/MILE)                     2.12 (   3.42)
   CO2  GRAMS/KM (GRAMS/MILE)                    219.9 (  353.9)
   NOX  GRAMS/KM (GRAMS/MILE)                      .01 (    .01)
   FUEL CONSUMPTION BY CB L/100KM(MPG)            9.54 (  24.65)
   CALCULATED DISTANCE KM (MILES)                16.90 (  10.50)
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                                    TABLE  A-3. VEHICLE EMISSION RESULTS
                                                   FTP                                         PROJECT NO. 11-4746-001

VEHICLE NO.EM-10                                    TEST NO.  2    RUN 1                  TEST WEIGHT   1364 KG(  3000 LBS)
VEHICLE MODEL    78 VOLVA  EM-10                    DATE  7/28/78                         ACTUAL ROAD LOAD   8.4 KW( 11.3 HP)
ENGINE 2.1 L(130 CID) L-4                           TIME 13:29                            GASOLINE EM-274-F
TRANSMISSION                                        DYNO NO.  3                           ODOMETER     127
GVW      0 KG(    -0 LBS)                           CVS NO.   2
                                                    BAG CART NO.  1

BAROMETER 741.43 MM HG(29.19 IN HG)                 RELATIVE HUMIDITY 64 PCT
DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)               ABSOLUTE HUMIDITY 10.2 GM/KG( 71.7 GRAINS/LB)      NOX HUMIDITY C.F.  .9846

BAG RESULTS
   BAG NUMBER                                          1                   2                  3
   DESCRIPTION                                   COLD TRANSIENT        STABILIZED         HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                 762.0 (30.0)         762.0 (30.0)        762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)               762.0 (30.0)         762.0 (30.0)        762.0 (30.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)              43.3 (110.0)         43.3 (110.0)        43.3 (110.0)
   BLOWER REVOLUTIONS                               40598                69541               40506
   CVS FLOW STD. CU. METRES(SCF)                  75.5 (2666.3)       129.3 (4566.2)       75.3 (2659.9)

   HC   SAMPLE METER/RANGE/PPM                   87.5/ 2/   88        34.0/ 2/   34       41.9/ 2/   42
   HC   BCKGRD METER/RANGE/PPM                   11.0/ 2/   11        13.0/ 2/   13       10.5/ 2/   10
   CO   SAMPLE METER/RANGE/PPM                   28.5/ 3/  664        87.9/12/  209       81.1/12/  188
   CO   BCKGRD METER/RANGE/PPM                     .3/ 3/    7         3.3/12/    6        1.4/12/    2
   CO2  SAMPLE METER/RANGE/PCT                   79.6/ 3/ 1.46        54.5/ 3/  .95       67.2/ 3/ 1.21
   CO2  BCKGRD METER/RANGE/PCT                    3.5/ 3/  .05         4.0/ 3/  .06        3.4/ 3/  .05
   NOX  SAMPLE METER/RANGE/PPM                    2.8/ 2/    3          .8/ 2/    1         .8/ 2/    1
   NOX  BCKGRD METER/RANGE/PPM                     .8/ 2/    1          .8/ 2/    1         .6/ 2/    1

   DILUTION FACTOR                                   8.74                13.70               10.90
   HC   CONCENTRATION PPM                             78                  22                  32
   CO   CONCENTRATION PPM                            626                 195                 178
   CO2  CONCENTRATION PCT                           1.41                 .90                1.16
   NOX  CONCENTRATION PPM                            2.1                  .1                  .3

   HC   MASS GRAMS                                  3.34                1.64                1.41
   CO   MASS GRAMS                                 55.04               29.42               15.57
   CO2  MASS GRAMS                                1954.7              2125.1              1599.9
   NOX  MASS GRAMS                                   .30                 .01                 .04

   HC   GRAMS/KM (GRAMS/MILE)                     .58 (   .94)        .27 (   .43)        .24 (   .39)
   CO   GRAMS/KM (GRAMS/MILE)                    9.45 ( 15.20)       4.80 (  7.72)       2.68 (  4.32)
   CO2  GRAMS/KM (GRAMS/MILE)                   335.5 ( 539.9)      346.5 ( 557.6)      275.7 ( 443.5)
   NOX  GRAMS/KM (GRAMS/MILE)                     .05 (   .08)        .00 (   .00)        .01 (   .01)
   FUEL CONSUMPTION BY CB L/100KM(MPG)          15.03 ( 15.65)      15.15 ( 15.53)      11.98 ( 19.64)
   CALCULATED DISTANCE KM (MILES)                5.83 (  3.62)       6.13 (  3.81)       5.80 (  3.61)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)             .33 (   .52)
   CO   GRAMS/KM (GRAMS/MILE)            5.19 (  8.34)
   CO2  GRAMS/KM (GRAMS/MILE)          324.59 (522.27)
   NOX  GRAMS/KM (GRAMS/MILE)             .01 (   .02)
   FUEL CONSUMPTION BY CB L/100KM (MPG)  14.25 ( 16.51)
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                                        TABLE  A-2. VEHICLE EMISSION RESULTS
                                                     FTPC
                                                                                          PROJECT NO. 11-4746-001
VEHICLE NO.EM-10
VEHICLE MODEL    78 VOLVO 244DL                 TEST NO.  3     RUN 1                  TEST WEIGHT    1364 KG(  3000 LBS)
ENGINE 2.1 L(130 CID) L-4                       DATE  8/29/78                          ACTUAL ROAD LOAD    8.4 KW( 11.3 HP)
TRANSMISSION M3                                 TIME 14:27                             GASOLINE
GVW      0 KG(    -0 LBS)                       DYNO NO.  2                            ODOMETER      146
                                                CVS NO.   7
                                                BAG CART NO.  1

BAROMETER 738.12 MM HG(29.06 IN HG)             RELATIVE HUMIDITY 47 PCT
DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)           ABSOLUTE HUMIDITY 10.2 GM/KG( 71.5 GRAINS/LB)      NOX HUMIDITY C.F.  .9840

BAG RESULTS
  BAG NUMBER                                         1                      2                      3
  DESCRIPTION                                 COLD TRANSIENT          STABILIZED            HOT TRANSIENT
  BLOWER DIF P MM. H2O(IN. H2O)               1600.2 (63.0)         1600.2 (63.0)         1600.2 (63.0)
  BLOWER INLET P MM. H2O(IN. H2O)             1447.8 (57.0)         1447.8 (57.0)         1447.8 (57.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)            43.3 (110.0)          43.3 (110.0)          43.3 (110.0)
  BLOWER REVOLUTIONS                             10390                 17795                 10368
  CVS FLOW STD. CU. METRES(SCF)                63.7 (2251.4)        109.2 (3855.7)         63.6 (2246.5)

  HC  SAMPLE METER/RANGE/PPM                  88.3/ 2/   88         21.1/ 2/   21         23.9/ 2/   24
  HC  BCKGRD METER/RANGE/PPM                  16.1/ 2/   16         14.0/ 2/   14         11.9/ 2/   12
  CO  SAMPLE METER/RANGE/PPM                  99.7/11/  536          7.2/13/    7         37.0/13/   35
  CO  BCKGRD METER/RANGE/PPM                   2.7/11/    8          4.7/13/    5          4.3/13/    4
  CO2 SAMPLE METER/RANGE/PCT                  82.6/ 3/ 1.52         54.0/ 3/  .94         73.9/ 3/ 1.34
  CO2 BCKGRD METER/RANGE/PCT                   3.0/ 3/  .05          3.2/ 3/  .05          3.5/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                  11.1/ 2/   11          4.8/ 2/    5          6.5/ 2/    7
  NOX BCKGRD METER/RANGE/PPM                    .3/ 2/    0           .3/ 2/    0           .3/ 2/    0

  DILUTION FACTOR                                 8.46                 14.14                  9.93
  HC  CONCENTRATION PPM                            74                     8                    13
  CO  CONCENTRATION PPM                           505                     3                    30
  CO2 CONCENTRATION PCT                           1.48                  .90                  1.30
  NOX CONCENTRATION PPM                           10.8                  4.5                   6.2

  HC  MASS GRAMS                                  2.72                  .51                   .48
  CO  MASS GRAMS                                 37.50                  .33                  2.21
  CO2 MASS GRAMS                                1731.4               1797.7                1509.2
  NOX MASS GRAMS                                  1.30                  .93                   .75

  HC  GRAMS/KM (GRAMS/MILE)                   .48 (   .76)          .08 (   .13)          .08 (   .14)
  CO  GRAMS/KM (GRAMS/MILE)                  6.54 ( 10.52)          .05 (   .08)          .39 (   .62)
  CO2 GRAMS/KM (GRAMS/MILE)                 302.0 ( 485.9)        290.3 ( 467.0)        263.6 ( 424.1)
  NOX GRAMS/KM (GRAMS/MILE)                   .23 (   .36)          .15 (   .24)          .13 (   .21)
  FUEL CONSUMPTION BY CB L/100KM(MPG)       13.39 ( 17.57)        12.40 ( 18.97)        11.29 ( 20.84)
  CALCULATED DISTANCE KM (MILES)             5.73 (  3.56)         6.19 (  3.85)         5.73 (  3.56)

COMPOSITE FTP RESULTS
  HC  GRAMS/KM (GRAMS/MILE)             .16 (   .26)
  CO  GRAMS/KM (GRAMS/MILE)            1.48 (  2.39)
  CO2 GRAMS/KM (GRAMS/MILE)          285.37 (459.16)
  NOX GRAMS/KM (GRAMS/MILE)             .16 (   .26)
  FUEL CONSUMPTION BY CB L/100KM (MPG) 12.30 ( 19.12)
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                                        TABLE A-1.  VEHICLE EMISSION RESULTS
                                                         FTP                                     PROJECT NO. 11-4746-001

VEHICLE NO.EM-10                                     TEST NO.  4     RUN 1                 TEST WEIGHT    1364 KG(  3000 LBS)
VEHICLE MODEL    78 VOLVO -244DL                     DATE   8/30/78                         ACTUAL ROAD LOAD    8.4 KW( 11.3 HP)
ENGINE 2.1 L(130 CID) L-4                            TIME 14:12                             GASOLINE
TRANSMISSION                                         DYNO NO.  2                            ODOMETER      157
GVW      0 KG(     -0 LBS)                           CVS NO.    7
                                                     BAG CART NO.  1

BAROMETER 740.92 MM HG(29.17 IN HG)                  RELATIVE HUMIDITY 59 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)                ABSOLUTE HUMIDITY 11.6 GM/KG( 81.3 GRAINS/LB)       NOX HUMIDITY C.F. 1.0306

BAG RESULTS
   BAG NUMBER                                             1                    2                    3
   DESCRIPTION                                     COLD TRANSIENT         STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                   1600.2 (63.0)        1600.2 (63.0)        1600.2 (63.0)
   BLOWER INLET P MM. H2O(IN. H2O)                 1473.2 (58.0)        1473.2 (58.0)        1473.2 (58.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)                 41.7 (107.0)         43.3 (110.0)         43.3 (110.0)
   BLOWER REVOLUTIONS                                  10389                17760                10383
   CVS FLOW STD. CU. METRES(SCF)                    64.2 (2266.0)       109.1 (3854.3)        63.8 (2253.2)

   HC   SAMPLE METER/RANGE/PPM                     75.3/ 2/    75       19.9/ 2/    20       20.7/ 2/    21
   HC   BCKGRD METER/RANGE/PPM                     13.5/ 2/    13       10.5/ 2/    10        9.1/ 2/     9
   CO   SAMPLE METER/RANGE/PPM                     98.8/11/   527       10.7/13/    10       17.3/13/    17
   CO   BCKGRD METER/RANGE/PPM                      5.0/11/    15        9.0/13/     9        6.2/13/     6
   CO2  SAMPLE METER/RANGE/PCT                     80.0/ 3/ 1.47        53.6/ 3/   .94       74.4/ 3/ 1.35
   CO2  BCKGRD METER/RANGE/PCT                      4.0/ 3/   .06        4.0/ 3/   .06        3.5/ 3/   .05
   NOX  SAMPLE METER/RANGE/PPM                     10.1/ 2/    10        4.4/ 2/     4        6.5/ 2/     7
   NOX  BCKGRD METER/RANGE/PPM                       .5/ 2/     1         .5/ 2/     1         .4/ 2/     0

   DILUTION FACTOR                                      8.77                14.26                 9.87
   HC   CONCENTRATION PPM                                63                   10                   13
   CO   CONCENTRATION PPM                               489                    2                   10
   CO2  CONCENTRATION PCT                              1.42                  .88                 1.31
   NOX  CONCENTRATION PPM                               9.7                  3.9                  6.1

   HC   MASS GRAMS                                     2.34                  .64                  .46
   CO   MASS GRAMS                                    36.51                  .25                  .78
   CO2  MASS GRAMS                                   1662.9               1758.4               1525.7
   NOX  MASS GRAMS                                     1.22                  .85                  .77

   HC   GRAMS/KM (GRAMS/MILE)                      .41 (   .66)         .10 (   .17)         .08 (   .13)
   CO   GRAMS/KM (GRAMS/MILE)                     6.42 ( 10.32)         .04 (   .07)         .14 (   .22)
   CO2  GRAMS/KM (GRAMS/MILE)                    292.2 ( 470.2)       285.1 ( 458.8)       268.6 ( 432.2)
   NOX  GRAMS/KM (GRAMS/MILE)                      .21 (   .35)         .14 (   .22)         .14 (   .22)
   FUEL CONSUMPTION BY CB L/100KM(MPG)           12.96 ( 18.15)       12.19 ( 19.30)       11.48 ( 20.48)
   CALCULATED DISTANCE KM (MILES)                 5.69 (  3.54)        6.17 (  3.83)        5.68 (  3.53)

 COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)                .16 (   .26)
   CO   GRAMS/KM (GRAMS/MILE)               1.38 (  2.22)
   CO2  GRAMS/KM (GRAMS/MILE)             282.08 (453.86)
   NOX  GRAMS/KM (GRAMS/MILE)                .15 (   .25)
   FUEL CONSUMPTION BY CB L/100KM (MPG)    12.15 ( 19.35)
 ERROR  [IH4041      1083078 9:15                  COLD TRANSIENT  CT 404V-8        SFMARL 01] END OF RECORD


*LINE NO.11          *ERROR DATA INPUT*  ILLEGAL DATA IN FIELD*        FORMAT NO.1001
ERROR NUMBER    0078 DETECTED BY KRAKER  AT ADDRESS 025256
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                                   TABLE       VEHICLE EMISSION RESULTS
                                                    FTP   SET
                                                                                     PROJECT NO. 11-4746-001
VEHICLE NO. EM10
VEHICLE MODEL    78 VOLVO 244DL                 TEST NO.  5    RUN 1                 TEST WEIGHT    1364 KG(  3000 LBS)
ENGINE 2.1 L(130 CID) L-4                       DATE  9/19/78                        ACTUAL ROAD LOAD   8.4 KW( 11.3 HP)
TRANSMISSION A3                                 TIME 09138                           GASOLINE  EM-274-F
GVW      0 KG(     -0 LBS)                      DYNO NO.  3                          ODOMETER    2648
                                                CVS NO.   2
                                                BAG CART NO.  1

BAROMETER 742.44 MM HG(29.23 IN HG)             RELATIVE HUMIDITY 61 PCT
DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)           ABSOLUTE HUMIDITY 10.9 GM/KG( 76.1 GRAINS/LB)      NOX HUMIDITY C.F. 1.0054

BAG RESULTS
   BAG NUMBER                                          1                    2                    3                    4
   DESCRIPTION                                  COLD TRANSIENT         STABILIZED          HOT TRANSIENT           SET-7
   BLOWER DIF P MM. H2O(IN. H2O)                 762.0 (30.0)         762.0 (30.0)         762.0 (30.0)         762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)               762.0 (30.0)         762.0 (30.0)         762.0 (30.0)         762.0 (30.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)              43.3 (110.0)         43.3 (110.0)         43.3 (110.0)         43.3 (110.0)
   BLOWER REVOLUTIONS                                40670                69822                40575               111927
   CVS FLOW STD. CU. METRES(SCF)                 75.7 (2675.1)       130.0 (4592.0)       75.6 (2668.7)       208.4 (7359.2)

   HC   SAMPLE METER/RANGE/PPM                  65.5/ 2/    65       17.5/ 2/    18       16.3/ 2/    16       16.7/ 2/    17
   HC   BCKGRD METER/RANGE/PPM                  18.8/ 2/    19       15.9/ 2/    16       12.9/ 2/    13       11.5/ 2/    11
   CO   SAMPLE METER/RANGE/PPM                  24.3/ 3/   562        4.9/13/     5        6.7/13/     7        8.7/13/     8
   CO   BCKGRD METER/RANGE/PPM                    .5/ 3/    11        2.5/13/     2        2.0/13/     2        2.6/13/     3
   CO2  SAMPLE METER/RANGE/PCT                  71.0/ 3/  1.28       48.2/ 3/   .83       61.7/ 3/  1.10       74.6/ 3/  1.36
   CO2  BCKGRD METER/RANGE/PCT                   3.5/ 3/   .05        4.2/ 3/   .06        4.2/ 3/   .06        3.3/ 3/   .05
   NOX  SAMPLE METER/RANGE/PPM                   7.8/ 2/     8        1.7/ 2/     2        5.1/ 2/     5        7.5/ 2/     8
   NOX  BCKGRD METER/RANGE/PPM                    .8/ 2/     1         .1/ 2/     0         .7/ 2/     1         .6/ 2/     1

   DILUTION FACTOR                                   9.96                16.05                12.19                 9.85
   HC   CONCENTRATION PPM                            49                    3                    4                    6
   CO   CONCENTRATION PPM                           527                    2                    4                    6
   CO2  CONCENTRATION PCT                           1.24                  .77                 1.04                 1.31
   NOX  CONCENTRATION PPM                           7.1                  1.6                  4.5                  7.0

   HC   MASS GRAMS                                  2.12                  .19                  .19                  .77
   CO   MASS GRAMS                                 46.52                  .36                  .39                 1.40
   CO2  MASS GRAMS                                1714.8               1838.2               1935.8               5009.5
   NOX  MASS GRAMS                                  1.03                  .40                  .65                 2.79

   HC   GRAMS/KM (GRAMS/MILE)                    .37 (    .60)        .03 (    .05)        .03 (    .05)        .04 (    .06)
   CO   GRAMS/KM (GRAMS/MILE)                   8.13 (  13.08)        .06 (    .09)        .07 (    .11)        .07 (    .11)
   CO2  GRAMS/KM (GRAMS/MILE)                  299.6 (  482.1)      300.7 (  483.9)      251.3 (  404.3)      233.5 (  375.7)
   NOX  GRAMS/KM (GRAMS/MILE)                    .18 (    .29)        .07 (    .11)        .11 (    .18)        .13 (    .21)
   FUEL CONSUMPTION BY CB L/100KM(MPG)         13.38 (  17.58)      12.84 (  18.32)      10.73 (  21.92)       9.98 (  23.58)
   CALCULATED DISTANCE KM (MILES)               5.72 (   3.56)       6.11 (   3.80)       5.71 (   3.55)      21.45 (  13.33)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)                     .10 (   .17)
   CO   GRAMS/KM (GRAMS/MILE)                    1.74 (  2.80)
   CO2  GRAMS/KM (GRAMS/MILE)                  286.88 (461.59)
   NOX  GRAMS/KM (GRAMS/MILE)                     .10 (   .17)
   FUEL CONSUMPTION BY CB L/100KM (MPG)         12.37 ( 19.01)

COMBINED FUEL ECONOMY L/100KM (MPG)             11.30 ( 20.83)
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                                  TABLE      VEHICLE EMISSION RESULTS
                                                      HFET
                                                                                     PROJECT NO. 11-4746-001
VEHICLE NO. EM10                                TEST NO. 5      RUN 3                TEST WEIGHT     1364 KG(   3000 LBS)
VEHICLE MODEL    78 VOLVO 244DL                 DATE  9/19/78                        ACTUAL ROAD LOAD    8.4 KW( 11.3 HP)
ENGINE 2.1 L(130 CID) L-4                       TIME                                 GASOLINE  EM-274-F
TRANSMISSION A3                                 DYNO NO.  3                          ODOMETER        -0
GVW       0 KG(     -0 LBS)                     CVS NO.   2
                                                BAG CART NO.  1

BAROMETER 741.68 MM HG(29.20 IN HG)             RELATIVE HUMIDITY 51 PCT
DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)           ABSOLUTE HUMIDITY  9.3 GM/KG( 64.9 GRAINS/LB)      NOX HUMIDITY C.F.  .9548

BAG RESULTS
   BAG NUMBER                                          1
   BLOWER DIF P MM. H2O(IN. H2O)                762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)              762.0 (30.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)             43.3 (110.0)
   BLOWER REVOLUTIONS                               61556
   CVS FLOW STD. CU. METRES(SCF)                114.5 (4044.5)

   HC   SAMPLE METER/RANGE/PPM                  18.9/ 2/   19
   HC   BCKGRD METER/RANGE/PPM                   9.8/ 2/   10
   CO   SAMPLE METER/RANGE/PPM                   9.2/13/    9
   CO   BCKGRD METER/RANGE/PPM                   3.2/13/    3
   CO2  SAMPLE METER/RANGE/PCT                  92.3/ 3/ 1.73
   CO2  BCKGRD METER/RANGE/PCT                   3.5/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                   15.3/ 2/   15
   NOX BCKGRD METER/RANGE/PPM                     .9/ 2/    1

   DILUTION FACTOR                                   7.75
   HC   CONCENTRATION PPM                            10
   CO   CONCENTRATION PPM                             6
   CO2 CONCENTRATION PCT                            1.68
   NOX CONCENTRATION PPM                            14.5

   HC   MASS GRAMS                                    .68
   CO   MASS GRAMS                                    .77
   CO2 MASS GRAMS                                 3522.6
   NOX MASS GRAMS                                   3.04

   HC   GRAMS/KM (GRAMS/MILE)                     .04 (    .07)
   CO   GRAMS/KM (GRAMS/MILE)                     .05 (    .08)
   CO2 GRAMS/KM (GRAMS/MILE)                    214.8 ( 345.7)
   NOX GRAMS/KM (GRAMS/MILE)                      .19 (    .30)
   FUEL CONSUMPTION BY CB L/100KM(MPG)           9.18 ( 25.63)
   CALCULATED DISTANCE KM (MILES)               16.40 ( 10.19)
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                                   TABLE      VEHICLE EMISSION RESULTS
                                                    FTP  SET
VEHICLE NO. EM10                                                                          PROJECT NO. 11-4746-001
VEHICLE MODEL   78 VOLVO 244DL                TEST NO. 6     RUN 1
ENGINE 2.1 L(130 CID) V-8                     DATE  9/20/78                            TEST WEIGHT   1364 KG(  3000 LBS)
TRANSMISSION A3                               TIME 12:45                               ACTUAL ROAD LOAD   8.4 KW( 11.3 HP)
GVW      0 KG(     -0 LBS)                    DYNO NO.  3                              GASOLINE  EM-274-F
                                              CVS NO.   2                              ODOMETER    3076
                                              BAG CART NO.  1                          IN STOCK CONDITION

BAROMETER 740.41 MM HG(29.15 IN HG)           RELATIVE HUMIDITY 48 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)         ABSOLUTE HUMIDITY  9.1 GM/KG( 63.4 GRAINS/LB)      NOX HUMIDITY C.F.  .9483

BAG RESULTS
  BAG NUMBER                                        1                   2                    3                    4
  DESCRIPTION                                COLD TRANSIENT        STABILIZED          HOT TRANSIENT          SET-7
  BLOWER DIF P MM. H2O(IN. H2O)              749.3 (29.5)         749.3 (29.5)         749.3 (29.5)         749.3 (29.5)
  BLOWER INLET P MM. H2O(IN. H2O)            749.3 (29.5)         749.3 (29.5)         749.3 (29.5)         749.3 (29.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)           43.3 (110.0)         43.3 (110.0)         43.3 (110.0)         43.3 (110.0)
  BLOWER REVOLUTIONS                            40605                69643                40649               112352
  CVS FLOW STD. CU. METRES(SCF)              75.5 (2667.4)       129.5 (4574.3)        75.6 (2670.4)       209.0 (7380.3)

  HC   SAMPLE METER/RANGE/PPM                65.9/ 2/   66        16.8/ 2/   17        18.6/ 2/   19        26.0/ 2/   26
  HC   BCKGRD METER/RANGE/PPM                10.5/ 2/   10         8.7/ 2/    9         7.6/ 2/    8         8.3/ 2/    8
  CO   SAMPLE METER/RANGE/PPM                27.9/ 3/  650        63.5/12/  142        53.4/12/  118        93.4/12/  228
  CO   BCKGRD METER/RANGE/PPM                  .2/ 3/    5         4.0/12/    7         3.2/12/    6         2.5/12/    4
  CO2  SAMPLE METER/RANGE/PCT                72.0/ 3/ 1.30        46.6/ 3/  .80        63.3/ 3/ 1.13        76.2/ 3/ 1.39
  CO2  BCKGRD METER/RANGE/PCT                 3.6/ 3/  .06         3.7/ 3/  .06         3.8/ 3/  .06         3.8/ 3/  .06
  NOX  SAMPLE METER/RANGE/PPM                 7.0/ 2/    7          .8/ 2/    1         4.0/ 2/    4         4.4/ 2/    4
  NOX  BCKGRD METER/RANGE/PPM                 1.1/ 2/    1          .5/ 2/    1          .9/ 2/    1          .5/ 2/    1

  DILUTION FACTOR                                 9.75                16.39                11.73                 9.47
  HC   CONCENTRATION PPM                          56                    9                   12                   19
  CO   CONCENTRATION PPM                          619                 131                  109                  215
  CO2  CONCENTRATION PCT                          1.26                 .75                 1.08                 1.34
  NOX  CONCENTRATION PPM                          6.0                  .3                  3.2                  4.0

  HC   MASS GRAMS                                 2.46                 .64                  .51                 2.24
  CO   MASS GRAMS                                54.47               19.82                 9.58                52.24
  CO2  MASS GRAMS                               1736.4              1775.7               1489.1               5124.1
  NOX  MASS GRAMS                                  .82                 .08                  .44                 1.50

  HC   GRAMS/KM (GRAMS/MILE)                   .43 (   .69)        .11 (   .17)        .09 (   .14)        .10 (   .17)
  CO   GRAMS/KM (GRAMS/MILE)                  9.52 ( 15.32)       3.25 (  5.23)       1.68 (  2.71)       2.43 (  3.91)
  CO2  GRAMS/KM (GRAMS/MILE)                 303.6 ( 488.4)      291.5 ( 469.0)      261.5 ( 420.7)      238.1 ( 383.1)
  NOX  GRAMS/KM (GRAMS/MILE)                   .14 (   .23)        .01 (   .02)        .08 (   .12)        .07 (   .11)
  FUEL CONSUMPTION BY CB L/100KM(MPG)        13.65 ( 17.23)      12.67 ( 18.56)      11.28 ( 20.85)      10.34 ( 22.75)
  CALCULATED DISTANCE KM (MILES)              5.72 (  3.56)       6.09 (  3.79)       5.70 (  3.54)      21.52 ( 13.37)
COMPOSITE FTP RESULTS
  HC   GRAMS/KM (GRAMS/MILE)                 .17 (   .27)
  CO   GRAMS/KM (GRAMS/MILE)                4.13 (  6.64)
  CO2  GRAMS/KM (GRAMS/MILE)              285.72 (459.72)
  NOX  GRAMS/KM (GRAMS/MILE)                 .06 (   .09)
  FUEL CONSUMPTION BY CB L/100KM (MPG)     12.49 ( 18.83)

COMBINED FUEL ECONOMY L/100KM (MPG)        11.52 ( 20.41)
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                                          TABLE      VEHICLE EMISSION RESULTS
                                                            HFET                                          PROJECT NU. 11-4746-001

VEHICLE NO. EM10                                     TEST NO. 6     RUN 3                        TEST WEIGHT   1364 KG(  3000 LBS)
VEHICLE MODEL   78 VOLVO 244DL                       DATE  9/20/78                               ACTUAL ROAD LOAD   8.4 KW( 11.3 HP)
ENGINE 2.1 L(130 CID) L-4                            TIME                                        GASOLINE  EM274-F
TRANSMISSION A3                                      DYNO NO.  3                                 ODOMETER       -0
GVW     0 KG(    -0 LBS)                             CVS NO.   2
                                                     BAG CART NO.  1

BAROMETER 740.41 MM HG(29.15 IN HG)                  RELATIVE HUMIDITY 48 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)                ABSOLUTE HUMIDITY  9.1 GM/KG( 63.4 GRAINS/LB)      NOX HUMIDITY C.F.  .9483

BAG RESULTS
   BAG NUMBER                                              1
   BLOWER DIF P MM. H2O(IN. H2O)                     749.3 (29.5)
   BLOWER INLET P MM. H2O(IN. H2O)                   749.3 (29.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)                  43.3 (110.0)
   BLOWER REVOLUTIONS                                    61681
   CVS FLOW STD. CU. METRES(SCF)                     114.7 (4052.3)

   HC  SAMPLE METER/RANGE/PPM                        33.5/ 2/    33
   HC  BCKGRD METER/RANGE/PPM                         9.7/ 2/    10
   CO  SAMPLE METER/RANGE/PPM                        71.3/11/   307
   CO  BCKGRD METER/RANGE/PPM                          .8/11/     2
   CO2 SAMPLE METER/RANGE/PCT                        93.7/ 3/  1.76
   CO2 BCKGRD METER/RANGE/PCT                         3.9/ 3/   .06
   NOX SAMPLE METER/RANGE/PPM                         4.9/ 2/     5
   NOX BCKGRD METER/RANGE/PPM                         1.0/ 2/     1

   DILUTION FACTOR                                        7.49
   HC  CONCENTRATION PPM                                   25
   CO  CONCENTRATION PPM                                  290
   CO2 CONCENTRATION PCT                                 1.70
   NOX CONCENTRATION PPM                                  4.0

   HC  MASS GRAMS                                         1.66
   CO  MASS GRAMS                                        38.70
   CO2 MASS GRAMS                                      3580.4
   NOX MASS GRAMS                                          .84

   HC  GRAMS/KM (GRAMS/MILE)                           .10 (    .16)
   CO  GRAMS/KM (GRAMS/MILE)                          2.37 (   3.82)
   CO2 GRAMS/KM (GRAMS/MILE)                         219.4 ( 353.0)
   NOX GRAMS/KM (GRAMS/MILE)                           .05 (    .08)
   FUEL CONSUMPTION BY CB L/100KM(MPG)                9.54 ( 24.67)
   CALCULATED DISTANCE KM (MILES)                    16.32 ( 10.14)
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                    TABLE      VEHICLE EMISSION RESULTS
                                         FTP                                        PROJECT NO. 11-4746-001

VEHICLE NO. EM10                                   TEST NO. 7     RUN 1           TEST WEIGHT   1364 KG(  3000 LBS)
VEHICLE MODEL   78 VOLVO 244DL                     DATE  9/21/78                  ACTUAL ROAD LOAD   8.4 KW( 11.3 HP)
ENGINE 2.1 L(130 CID) L-4                          TIME 13:25                     GASOLINE  EM-274-F
TRANSMISSION A3                                    DYNO NO.  3                    ODOMETER    3118
GVW     0 KG(    -0 LBS)                           CVS NO.   2                    1 MINUTE OF AIR INJECTION INTO MANIFOLD
                                                   BAG CART NO.  1

BAROMETER 742.44 MM HG(29.23 IN HG)                RELATIVE HUMIDITY 60 PCT
DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)              ABSOLUTE HUMIDITY  9.6 GM/KG( 66.9 GRAINS/LB)      NOX HUMIDITY C.F.  .9633

BAG RESULTS
   BAG NUMBER                                          1                    2                     3
   DESCRIPTION                                  COLD TRANSIENT         STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                749.3 (29.5)         749.3 (29.5)         749.3 (29.5)
   BLOWER INLET P MM. H2O(IN. H2O)              749.3 (29.5)         749.3 (29.5)         749.3 (29.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)             43.3 (110.0)         42.8 (109.0)         43.3 (110.0)
   BLOWER REVOLUTIONS                               40812                69614                40633
   CVS FLOW STD. CU. METRES(SCF)                 76.2 (2689.8)       130.0 (4590.9)        75.8 (2677.5)

   HC  SAMPLE METER/RANGE/PPM                   65.8/ 2/   66        15.8/ 2/   16        19.2/ 2/   19
   HC  BCKGRD METER/RANGE/PPM                   10.9/ 2/   11         9.8/ 2/   10        10.6/ 2/   11
   CO  SAMPLE METER/RANGE/PPM                   32.2/ 3/  756        96.0/13/   98        51.3/12/  113
   CO  BCKGRD METER/RANGE/PPM                     .1/ 3/    2         3.0/13/    3         1.2/12/    2
   CO2 SAMPLE METER/RANGE/PCT                   70.7/ 3/ 1.28        46.4/ 3/  .80        62.0/ 3/ 1.10
   CO2 BCKGRD METER/RANGE/PCT                    3.2/ 3/  .05         3.9/ 3/  .06         3.9/ 3/  .06
   NOX SAMPLE METER/RANGE/PPM                    5.1/ 2/    5          .8/ 2/    1         4.0/ 2/    4
   NOX BCKGRD METER/RANGE/PPM                     .6/ 2/    1          .7/ 2/    1          .5/ 2/    1

   DILUTION FACTOR                                  9.87                16.56                12.01
   HC  CONCENTRATION PPM                            56                    7                    9
   CO  CONCENTRATION PPM                           721                   92                  107
   CO2 CONCENTRATION PCT                            1.23                 .74                 1.05
   NOX CONCENTRATION PPM                            4.6                  .1                  3.5

   HC  MASS GRAMS                                   2.46                 .49                  .41
   CO  MASS GRAMS                                  63.90               13.87                 9.43
   CO2 MASS GRAMS                                1721.6               1766.1               1454.9
   NOX MASS GRAMS                                    .64                 .03                  .49

   HC  GRAMS/KM (GRAMS/MILE)                    .43 (   .69)        .08 (   .13)        .07 (   .12)
   CO  GRAMS/KM (GRAMS/MILE)                  11.12 ( 17.89)       2.27 (  3.66)       1.65 (  2.65)
   CO2 GRAMS/KM (GRAMS/MILE)                  299.6 ( 482.0)      289.3 ( 465.5)      254.2 ( 409.0)
   NOX GRAMS/KM (GRAMS/MILE)                    .11 (   .18)        .01 (   .01)        .09 (   .14)
   FUEL CONSUMPTION BY CB L/100KM(MPG)        13.59 ( 17.31)      12.51 ( 18.80)      10.97 ( 21.45)
   CALCULATED DISTANCE KM (MILES)              5.75 (  3.57)       6.10 (  3.79)       5.72 (  3.56)

COMPOSITE FTP RESULTS
   HC  GRAMS/KM (GRAMS/MILE)            .15 (   .24)
   CO  GRAMS/KM (GRAMS/MILE)           3.95 (  6.35)
   CO2 GRAMS/KM (GRAMS/MILE)         281.77 (453.36)
   NOX GRAMS/KM (GRAMS/MILE)            .05 (   .08)
   FUEL CONSUMPTION BY CB L/100KM (MPG)  12.31 ( 19.11)
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                      TABLE      VEHICLE EMISSION RESULTS
                                         CFTP 3 BAG                                    PROJECT NO. 11-4746-001
VEHICLE NO.   10                              TEST NO.  8    RUN 1                  TEST WEIGHT   1364 KG(  3000 LBS)
VEHICLE MODEL   78 VOLVO 244 DL               DATE  9/29/78                         ACTUAL ROAD LOAD    8.4 KW( 11.3 HP)
ENGINE 2.1 L(130 CID) L-4                     TIME                                  GASOLINE
TRANSMISSION A3                               DYNO NO.  3                           ODOMETER    3128
GVW      0 KG(     -0 LBS)                    CVS NO.   2                           IN STOCK CONDITION WITH CO ADJUSTMENT
                                              BAG CART NO.  1

BAROMETER 742.19 MM HG(29.22 IN HG)           RELATIVE HUMIDITY 58 PCT
DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)         ABSOLUTE HUMIDITY 10.2 GM/KG( 71.3 GRAINS/LB)      NOX HUMIDITY C.F.  .9829

BAG RESULTS
   BAG NUMBER                                       1                    2                     3
   DESCRIPTION                               COLD TRANSIENT         STABILIZED           HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)              711.2 (28.0)        711.2 (28.0)          711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)            685.8 (27.0)        698.5 (27.5)          698.5 (27.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)           44.4 (112.0)        43.3 (110.0)          44.4 (112.0)
   BLOWER REVOLUTIONS                             40636               69648                 40527
   CVS FLOW STD. CU. METRES(SCF)               76.3 (2694.0)      130.8 (4619.2)         76.0 (2682.7)

   HC   SAMPLE METER/RANGE/PPM                52.6/ 2/    53      10.1/ 2/    10        11.5/ 2/    11
   HC   BCKGRD METER/RANGE/PPM                20.1/ 2/    20      15.6/ 2/    16        14.7/ 2/    15
   CO   SAMPLE METER/RANGE/PPM                83.9/11/   395       9.8/13/     9        10.5/13/    10
   CO   BCKGRD METER/RANGE/PPM                 3.0/11/     9       9.5/13/     9         7.6/13/     7
   CO2  SAMPLE METER/RANGE/PCT                63.4/ 3/ 1.13       43.3/ 3/  .74        58.5/ 3/ 1.03
   CO2  BCKGRD METER/RANGE/PCT                 3.9/ 3/  .06        4.8/ 3/  .07         4.4/ 3/  .07
   NOX  SAMPLE METER/RANGE/PPM                22.4/ 2/    22       7.9/ 2/     8        18.1/ 2/    18
   NOX  BCKGRD METER/RANGE/PPM                 1.4/ 2/     1       1.1/ 2/     1         1.0/ 2/     1

   DILUTION FACTOR                              11.41               18.07                 12.94
   HC   CONCENTRATION PPM                         34                  -5                    -2
   CO   CONCENTRATION PPM                        371                   1                     3
   CO2  CONCENTRATION PCT                       1.08                 .67                   .97
   NOX  CONCENTRATION PPM                       21.1                 6.9                  17.2

   HC   MASS GRAMS                               1.51                -.35                  -.09
   CO   MASS GRAMS                              32.97                 .10                   .27
   CO2  MASS GRAMS                             1503.3              1604.0                1350.4
   NOX  MASS GRAMS                               3.03                1.69                  2.45

   HC   GRAMS/KM (GRAMS/MILE)                 .27 (   .43)       -.06 (  -.09)         -.02 (  -.03)
   CO   GRAMS/KM (GRAMS/MILE)                5.81 (  9.35)        .02 (   .03)          .05 (   .08)
   CO2  GRAMS/KM (GRAMS/MILE)               264.9 ( 426.2)      264.6 ( 425.7)        238.1 ( 383.2)
   NOX  GRAMS/KM (GRAMS/MILE)                 .53 (   .86)        .28 (   .45)          .43 (   .70)
   FUEL CONSUMPTION BY CB L/100KM(MPG)      11.73 ( 20.05)      11.29 ( 20.84)        10.17 ( 23.14)
   CALCULATED DISTANCE KM (MILES)            5.67 (  3.53)       6.06 (  3.77)         5.67 (  3.52)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)           .02 (   .03)
   CO   GRAMS/KM (GRAMS/MILE)          1.23 (  1.98)
   CO2  GRAMS/KM (GRAMS/MILE)        257.37 (414.11)
   NOX  GRAMS/KM (GRAMS/MILE)           .37 (   .60)
   FUEL CONSUMPTION BY CB L/100KM (MPG)  11.07 ( 21.25)
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                             TABLE      VEHICLE EMISSION RESULTS
                                               CFTP                                      PROJECT NO. 11-4746-001

VEHICLE NO.    10                               TEST NO.        RUN 1              TEST WEIGHT    1364 KG(  3000 LBS)
VEHICLE MODEL    78 VOLVO 244 DL                DATE 10/ 5/78                      ACTUAL ROAD LOAD    8.4 KW( 11.3 HP)
ENGINE 2.1 L(130 CID) L-4                       TIME  8:45                         GASOLINE
TRANSMISSION A3                                 DYNO NO.  2                        ODOMETER     2648
GVW      0 KG(     -0 LBS)                      CVS NO.   7
                                                BAG CART NO.  1

BAROMETER 741.49 MM HG(29.19 IN HG)             RELATIVE HUMIDITY 74 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)           ABSOLUTE HUMIDITY 14.7 GM/KG(102.8 GRAINS/LB)      NOX HUMIDITY C.F. 1.1504

BAG RESULTS
   BAG NUMBER                                          1                    2                    3
   DESCRIPTION                                  COLD TRANSIENT          STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                1600.2 (63.0)        1625.6 (64.0)        1625.6 (64.0)
   BLOWER INLET P MM. H2O(IN. H2O)              1473.2 (58.0)        1498.6 (59.0)        1498.6 (59.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)              43.3 (110.0)         44.4 (112.0)         43.3 (110.0)
   BLOWER REVOLUTIONS                                10368                17825                10363
   CVS FLOW STD. CU. METRES(SCF)                 60.9 (2152.6)       103.9 (3671.3)        60.6 (2141.1)

   HC  SAMPLE METER/RANGE/PPM                   66.6/ 2/   67        19.0/ 2/   19        23.8/ 2/   24
   HC  BCKGRD METER/RANGE/PPM                   22.4/ 2/   22        18.9/ 2/   19        23.5/ 2/   23
   CO  SAMPLE METER/RANGE/PPM                   99.2/11/  492        12.2/13/   12         9.8/13/    9
   CO  BCKGRD METER/RANGE/PPM                    6.0/11/   19        12.1/13/   12         8.7/13/    8
   CO2 SAMPLE METER/RANGE/PCT                   77.8/ 3/ 1.42        50.9/ 3/  .88        70.4/ 3/ 1.27
   CO2 BCKGRD METER/RANGE/PCT                    4.9/ 3/  .08         4.7/ 3/  .07         4.5/ 3/  .07
   NOX SAMPLE METER/RANGE/PPM                   32.9/ 2/   33         9.9/ 2/   10        25.2/ 2/   25
   NOX BCKGRD METER/RANGE/PPM                    1.7/ 2/    2         1.5/ 2/    2         1.3/ 2/    1

   DILUTION FACTOR                                  9.07                15.10                10.50
   HC  CONCENTRATION PPM                              47                    1                    3
   CO  CONCENTRATION PPM                             450                    1                    2
   CO2 CONCENTRATION PCT                            1.36                  .82                 1.21
   NOX CONCENTRATION PPM                            31.4                  8.5                 24.0

   HC  MASS GRAMS                                   1.64                  .08                  .09
   CO  MASS GRAMS                                  31.97                  .08                  .11
   CO2 MASS GRAMS                                 1514.7               1555.2               1343.0
   NOX MASS GRAMS                                   4.21                 1.94                 3.20

   HC  GRAMS/KM (GRAMS/MILE)                     .29 (    .46)         .01 (    .02)         .02 (    .02)
   CO  GRAMS/KM (GRAMS/MILE)                    5.56 (   8.95)         .01 (    .02)         .02 (    .03)
   CO2 GRAMS/KM (GRAMS/MILE)                   263.6 (  424.1)       251.0 (  403.8)       235.0 (  378.1)
   NOX GRAMS/KM (GRAMS/MILE)                     .73 (   1.18)         .31 (    .50)         .56 (    .90)
   FUEL CONSUMPTION BY CB L/100KM(MPG)         11.66 (  20.17)       10.71 (  21.96)       10.03 (  23.44)
   CALCULATED DISTANCE KM (MILES)               5.75 (   3.57)        6.20 (   3.85)        5.71 (   3.55)

COMPOSITE FTP RESULTS
   HC  GRAMS/KM (GRAMS/MILE)                .07 (    .11)
   CO  GRAMS/KM (GRAMS/MILE)               1.16 (   1.87)
   CO2 GRAMS/KM (GRAMS/MILE)             249.21 ( 400.98)
   NOX GRAMS/KM (GRAMS/MILE)                .47 (    .75)
   FUEL CONSUMPTION BY CB L/100KM (MPG)   10.72 (  21.94)
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                        TABLE    VEHICLE EMISSION RESULTS
                                          FTP                                  PROJECT NO. 11-4746-001

VEHICLE NO.EM-10                          TEST NO.     7  RUN 1              TEST WEIGHT    1364 KG(  3000 LBS)
VEHICLE MODEL    78 VOLVO                 DATE 10/10/78                      ACTUAL ROAD LOAD   8.4 KW( 11.3 HP)
ENGINE 2.1 L(130 CID) L-4                 TIME 13:53                         GASOLINE EM-274-F
TRANSMISSION A3                           DYNO NO.  3                        ODOMETER     2648
GVW      0 KG(     -0 LBS)                CVS NO.   2
                                          BAG CART NO.  1

BAROMETER 741.17 MM HG(29.18 IN HG)       RELATIVE HUMIDITY 45 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)     ABSOLUTE HUMIDITY  8.8 GM/KG( 61.6 GRAINS/LB)      NOX HUMIDITY C.F.  .9409

BAG RESULTS
   BAG NUMBER                                     1                  2                   3
   DESCRIPTION                             COLD TRANSIENT       STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)            736.6 (29.0)       736.6 (29.0)        736.6 (29.0)
   BLOWER INLET P MM. H2O(IN. H2O)          736.6 (29.0)       736.6 (29.0)        736.6 (29.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)         42.8 (109.0)       40.6 (105.0)        44.4 (112.0)
   BLOWER REVOLUTIONS                          40675              69612               40650
   CVS FLOW STD. CU. METRES(SCF)             76.0 (2682.7)     130.5 (4608.7)       75.7 (2673.1)

   HC  SAMPLE METER/RANGE/PPM               50.4/ 2/   50       7.4/ 2/    7        8.5/ 2/    9
   HC  BCKGRD METER/RANGE/PPM               13.9/ 2/   14      11.6/ 2/   12        8.8/ 2/    9
   CO  SAMPLE METER/RANGE/PPM               92.1/11/  464       9.0/13/    9        6.8/13/    7
   CO  BCKGRD METER/RANGE/PPM                5.1/11/   16       8.2/13/    8        5.1/13/    5
   CO2 SAMPLE METER/RANGE/PCT               69.9/ 3/ 1.26      44.6/ 3/  .76       61.1/ 3/ 1.08
   CO2 BCKGRD METER/RANGE/PCT                4.2/ 3/  .06       4.9/ 3/  .08        4.9/ 3/  .08
   NOX SAMPLE METER/RANGE/PPM               20.2/ 2/   20       5.0/ 2/    5       16.9/ 2/   17
   NOX BCKGRD METER/RANGE/PPM                 .6/ 2/    1        .6/ 2/    1         .6/ 2/    1

   DILUTION FACTOR                             10.22              17.50               12.34
   HC  CONCENTRATION PPM                          38                 -4                   0
   CO  CONCENTRATION PPM                         432                  1                   2
   CO2 CONCENTRATION PCT                        1.20                .69                1.02
   NOX CONCENTRATION PPM                        19.7                4.4                16.3

   HC  MASS GRAMS                               1.66               -.27                 .02
   CO  MASS GRAMS                              38.17                .16                 .16
   CO2 MASS GRAMS                             1674.7             1655.7              1407.6
   NOX MASS GRAMS                               2.69               1.04                2.23

   HC  GRAMS/KM (GRAMS/MILE)                 .28 (   .46)     -.04 (  -.07)        .00 (   .01)
   CO  GRAMS/KM (GRAMS/MILE)                6.55 ( 10.54)      .03 (   .04)        .03 (   .05)
   CO2 GRAMS/KM (GRAMS/MILE)               287.6 ( 462.7)    268.8 ( 432.5)      244.3 ( 393.1)
   NOX GRAMS/KM (GRAMS/MILE)                 .46 (   .74)      .17 (   .27)        .39 (   .62)
   FUEL CONSUMPTION BY CB L/100KM(MPG)     12.75 ( 18.45)    11.47 ( 20.51)      10.43 ( 22.55)
   CALCULATED DISTANCE KM (MILES)           5.82 (  3.62)     6.16 (  3.83)       5.76 (  3.58)

COMPOSITE FTP RESULTS
   HC  GRAMS/KM (GRAMS/MILE)             .04 (   .06)
   CO  GRAMS/KM (GRAMS/MILE)            1.39 (  2.24)
   CO2 GRAMS/KM (GRAMS/MILE)          265.99 (427.98)
   NOX GRAMS/KM (GRAMS/MILE)             .29 (   .47)
   FUEL CONSUMPTION BY CB L/100KM (MPG) 11.45 ( 20.54)
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                              TABLE      VEHICLE EMISSION RESULTS
                                                SET
                                                                              PROJECT NO. 11-4746-001
VEHICLE NO.EM-10                                 TEST NO.     7  RUN 1               TEST WEIGHT   1364 KG(  3000 LBS)
VEHICLE MODEL   78 VOLVO                         DATE 10/10/78                       ACTUAL ROAD LOAD   8.4 KW( 11.3 HP)
ENGINE 2.1 L(130 CID) L-4                        TIME 14:50                          GASOLINE EM-274-F
TRANSMISSION                                     DYNO NO.  3                         ODOMETER       -0
GVW     0 KG(    -0 LBS)                         CVS NO.   2
                                                 BAG CART NO.  1

BAROMETER 741.17 MM HG(29.18 IN HG)              RELATIVE HUMIDITY 42 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)            ABSOLUTE HUMIDITY  8.6 GM/KG( 60.0 GRAINS/LB)      NOX HUMIDITY C.F.  .9340

BAG RESULTS
  BAG NUMBER                                            1
  BLOWER DIF P MM. H2O(IN. H2O)                  736.6 (29.0)
  BLOWER INLET P MM. H2O(IN. H2O)                736.6 (29.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)              42.8 (109.0)
  BLOWER REVOLUTIONS                               112339
  CVS FLOW STD. CU. METRES(SCF)                  209.8 (7409.0)

  HC  SAMPLE METER/RANGE/PPM                      9.4/ 2/     9
  HC  BCKGRD METER/RANGE/PPM                     10.6/ 2/    11
  CO  SAMPLE METER/RANGE/PPM                      4.8/13/     5
  CO  BCKGRD METER/RANGE/PPM                      3.8/13/     4
  CO2 SAMPLE METER/RANGE/PCT                     72.6/ 3/  1.32
  CO2 BCKGRD METER/RANGE/PCT                      5.0/ 3/   .08
  NOX SAMPLE METER/RANGE/PPM                     10.8/ 2/    11
  NOX BCKGRD METER/RANGE/PPM                      1.4/ 2/     1

  DILUTION FACTOR                                   10.16
  HC  CONCENTRATION PPM                               -0
  CO  CONCENTRATION PPM                                1
  CO2 CONCENTRATION PCT                             1.25
  NOX CONCENTRATION PPM                              9.5

  HC  MASS GRAMS                                    -.02
  CO  MASS GRAMS                                     .29
  CO2 MASS GRAMS                                  4793.7
  NOX MASS GRAMS                                    3.57

  HC  GRAMS/KM (GRAMS/MILE)                      -.00 (  -.00)
  CO  GRAMS/KM (GRAMS/MILE)                       .01 (   .02)
  CO2 GRAMS/KM (GRAMS/MILE)                     218.4 ( 351.5)
  NOX GRAMS/KM (GRAMS/MILE)                       .16 (   .26)
  FUEL CONSUMPTION BY CB L/100KM(MPG)            9.32 ( 25.23)
  CALCULATED DISTANCE KM (MILES)                21.95 ( 13.64)
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                                          TABLE      VEHICLE EMISSION RESULTS
                                                              HFET
VEHICLE NO.EM-10                                                                              PROJECT NO. 11-4746-001
VEHICLE MODEL    78 VOLVO                        TEST NO.    7  RUN 1
ENGINE 2.1 L(130 CID) L-4                        DATE 10/10/78                       TEST WEIGHT   1364 KG(  3000 LBS)
TRANSMISSION                                     TIME                                ACTUAL ROAD LOAD   8.4 KW( 11.3 HP)
GVW      0 KG(    -0 LBS)                        DYNO NO.  3                         GASOLINE  EM-274-F
                                                 CVS NO.   2                         ODOMETER      -0
                                                 BAG CART NO.  1
BAROMETER 741.17 MM HG(29.18 IN HG)
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)            RELATIVE HUMIDITY 48 PCT
                                                 ABSOLUTE HUMIDITY  9.0 GM/KG( 63.3 GRAINS/LB)      NOX HUMIDITY C.F.  .9479
BAG RESULTS
   BAG NUMBER
   BLOWER DIF P MM. H2O(IN. H2O)                        1
   BLOWER INLET P MM. H2O(IN. H2O)              736.6 (29.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)            736.6 (29.0)
   BLOWER REVOLUTIONS                            42.8 (109.0)
   CVS FLOW STD. CU. METRES(SCF)                    61689
                                                115.2 (4068.9)
   HC   SAMPLE METER/RANGE/PPM
   HC   BCKGRD METER/RANGE/PPM                  11.5/ 2/    11
   CO   SAMPLE METER/RANGE/PPM                  10.1/ 2/    10
   CO   BCKGRD METER/RANGE/PPM                   5.1/13/     5
   CO2 SAMPLE METER/RANGE/PCT                    4.7/13/     5
   CO2 BCKGRD METER/RANGE/PCT                   94.1/ 3/  1.76
   NOX SAMPLE METER/RANGE/PPM                    4.6/ 3/   .07
   NOX BCKGRD METER/RANGE/PPM                   17.0/ 2/    17
                                                 1.2/ 2/     1
   DILUTION FACTOR
   HC   CONCENTRATION PPM                            7.59
   CO   CONCENTRATION PPM                              3
   CO2 CONCENTRATION PCT                               1
   NOX CONCENTRATION PPM                            1.70
                                                    16.0
   HC   MASS GRAMS
   CO   MASS GRAMS                                   .18
   CO2 MASS GRAMS                                    .11
   NOX MASS GRAMS                                 3592.7
                                                    3.33
   HC   GRAMS/KM (GRAMS/MILE)
   CO   GRAMS/KM (GRAMS/MILE)                     .01 (    .02)
   CO2 GRAMS/KM (GRAMS/MILE)                      .01 (    .01)
   NOX GRAMS/KM (GRAMS/MILE)                    213.4 ( 343.4)
   FUEL CONSUMPTION BY CB L/100KM(MPG)            .20 (    .32)
   CALCULATED DISTANCE KM (MILES)                9.11 ( 25.82)
                                                16.84 ( 10.46)
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                        TABLE      VEHICLE EMISSION RESULTS
                                          FPP-C
                                                                              PROJECT NO. 11-4746-001
VEHICLE NO.  244
VEHICLE MODEL    78 VOLVO  244DL              TEST NO.    8  RUN 1              TEST WEIGHT   1591 KG(  3500 LBS)
ENGINE 2.1 L(130 CID) L-4                     DATE 12/ 1/78                     ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
TRANSMISSION                                  TIME                              GASOLINE EM-274-F
GVW     0 KG(    -0 LBS)                      DYNO NO.  3                       ODOMETER     3783
                                              CVS NO.   2
                                              BAG CART NO.  1

BAROMETER 740.16 MM HG(29.14 IN HG)           RELATIVE HUMIDITY 35 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)         ABSOLUTE HUMIDITY  6.9 GM/KG( 48.1 GRAINS/LB)      NOX HUMIDITY C.F.  .8879

BAG RESULTS
  BAG NUMBER                                         1                      2                      3
  DESCRIPTION                                COLD TRANSIENT            STABILIZED           HOT TRANSIENT
  BLOWER DIF P MM. H2O(IN. H2O)               736.6 (29.0)           736.6 (29.0)           736.6 (29.0)
  BLOWER INLET P MM. H2O(IN. H2O)             723.9 (28.5)           723.9 (28.5)           723.9 (28.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)            43.3 (110.0)           42.2 (108.0)           43.3 (110.0)
  BLOWER REVOLUTIONS                             40674                  69924                  40613
  CVS FLOW STD. CU. METRES(SCF)               75.9 (2679.7)         130.7 (4615.5)          75.7 (2675.5)

  HC   SAMPLE METER/RANGE/PPM                89.0/ 2/    89          6.2/ 2/    6          11.5/ 2/   11
  HC   BCKGRD METER/RANGE/PPM                 8.2/ 2/     8          6.5/ 2/    7           6.3/ 2/    6
  CO   SAMPLE METER/RANGE/PPM                24.4/ 3/   565          4.3/13/    4          17.2/13/   16
  CO   BCKGRD METER/RANGE/PPM                  .5/ 3/    11          2.1/13/    2            .9/13/    1
  CO2  SAMPLE METER/RANGE/PCT                67.2/ 3/  1.21         44.1/ 3/  .75          56.8/ 3/ 1.00
  CO2  BCKGRD METER/RANGE/PCT                 4.3/ 3/   .07          3.6/ 3/  .06           3.6/ 3/  .06
  NOX  SAMPLE METER/RANGE/PPM                13.0/ 2/    13          5.6/ 2/    6          14.1/ 2/   14
  NOX  BCKGRD METER/RANGE/PPM                  .9/ 2/     1          1.5/ 2/    2           1.6/ 2/    2

  DILUTION FACTOR                                10.54                  17.73                  13.37
  HC   CONCENTRATION PPM                            82                      0                      6
  CO   CONCENTRATION PPM                           535                      2                     15
  CO2  CONCENTRATION PCT                          1.15                    .70                    .95
  NOX  CONCENTRATION PPM                          12.2                    4.2                   12.6

  HC   MASS GRAMS                                 3.57                    .01                    .25
  CO   MASS GRAMS                                47.28                    .33                   1.33
  CO2  MASS GRAMS                               1594.5                 1681.1                 1315.9
  NOX  MASS GRAMS                                 1.57                    .93                   1.62

  HC   GRAMS/KM (GRAMS/MILE)                .62 (  1.00)           .00 (   .00)           .04 (   .07)
  CO   GRAMS/KM (GRAMS/MILE)               8.20 ( 13.19)           .05 (   .09)           .23 (   .37)
  CO2  GRAMS/KM (GRAMS/MILE)              276.4 ( 444.8)         271.5 ( 436.9)         228.3 ( 367.4)
  NOX  GRAMS/KM (GRAMS/MILE)                .27 (   .44)           .15 (   .24)           .28 (   .45)
  FUEL CONSUMPTION BY CB L/100KM(MPG)     12.43 ( 18.92)         11.59 ( 20.29)          9.77 ( 24.08)
  CALCULATED DISTANCE KM (MILES)           5.77 (  3.59)          6.19 (  3.85)          5.76 (  3.58)

COMPOSITE FTP RESULTS
  HC   GRAMS/KM (GRAMS/MILE)            .14 (   .23)
  CO   GRAMS/KM (GRAMS/MILE)           1.79 (  2.88)
  CO2  GRAMS/KM (GRAMS/MILE)         260.67 (419.42)
  NOX  GRAMS/KM (GRAMS/MILE)            .21 (   .34)
  FUEL CONSUMPTION BY CB L/100KM (MPG)  11.26 ( 20.88)
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                         TABLE      VEHICLE EMISSION RESULTS                        PROJECT NO. 11-4746-001
                                            CFTP

VEHICLE NO.  365                            TEST NO.        RUN             TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO                    DATE  1/16/79                   ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                   TIME                            GASOLINE
TRANSMISSION                                DYNO NO.  2                     ODOMETER    3956
GVW      0 KG(     -0 LBS)                  CVS NO.   8
                                            BAG CART NO.  1

BAROMETER 745.24 MM HG(29.34 IN HG)         RELATIVE HUMIDITY 42 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)       ABSOLUTE HUMIDITY  8.5 GM/KG( 59.5 GRAINS/LB)      NOX HUMIDITY C.F.  .9321

BAG RESULTS
   BAG NUMBER                                    1                  2                  3
   DESCRIPTION                            COLD TRANSIENT       STABILIZED        HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)          1219.2 (48.0)      1219.2 (48.0)      1219.2 (48.0)
   BLOWER INLET P MM. H2O(IN. H2O)         792.5 (31.2)       792.5 (31.2)       792.5 (31.2)
   BLOWER INLET TEMP. DEG. C(DEG. F)        43.3 (110.0)       43.3 (110.0)       43.3 (110.0)
   BLOWER REVOLUTIONS                         12467              21304              12491
   CVS FLOW STD. CU. METRES(SCF)           86.0 (3035.9)     146.8 (5185.1)      86.1 (3042.2)

   HC   SAMPLE METER/RANGE/PPM            65.5/ 2/    65     18.0/ 2/    18     25.8/ 2/    26
   HC   BCKGRD METER/RANGE/PPM             9.7/ 2/    10     11.4/ 2/    11     12.5/ 2/    13
   CO   SAMPLE METER/RANGE/PPM            92.7/11/   469     42.7/13/    40     91.3/13/    92
   CO   BCKGRD METER/RANGE/PPM             2.1/11/     6      4.4/13/     4      5.4/13/     5
   CO2  SAMPLE METER/RANGE/PCT            63.4/ 3/  1.13     43.1/ 3/   .74     59.1/ 3/  1.05
   CO2  BCKGRD METER/RANGE/PCT             4.1/ 3/   .06      4.5/ 3/   .07      3.8/ 3/   .06
   NOX  SAMPLE METER/RANGE/PPM             8.2/ 2/     8      2.9/ 2/     3      6.1/ 2/     6
   NOX  BCKGRD METER/RANGE/PPM             1.4/ 2/     1      2.0/ 2/     2      2.3/ 2/     2

   DILUTION FACTOR                             11.33              18.07              12.68
   HC   CONCENTRATION PPM                         57                  7                 14
   CO   CONCENTRATION PPM                        447                 35                 84
   CO2  CONCENTRATION PCT                       1.07                .67                .99
   NOX  CONCENTRATION PPM                        6.9                1.0                4.0

   HC   MASS GRAMS                              2.81                .61                .71
   CO   MASS GRAMS                             44.69               6.04               8.46
   CO2  MASS GRAMS                            1689.7             1802.2             1563.8
   NOX  MASS GRAMS                              1.06                .26                .61

   HC   GRAMS/KM (GRAMS/MILE)              .48 (   .77)       .10 (   .16)       .12 (   .20)
   CO   GRAMS/KM (GRAMS/MILE)             7.65 ( 12.31)       .96 (  1.55)      1.45 (  2.33)
   CO2  GRAMS/KM (GRAMS/MILE)            289.3 ( 465.5)     286.6 ( 461.2)     268.1 ( 431.3)
   NOX  GRAMS/KM (GRAMS/MILE)              .18 (   .29)       .04 (   .07)       .10 (   .17)
   FUEL CONSUMPTION BY CB L/100KM(MPG)   12.93 ( 18.20)     12.31 ( 19.11)     11.55 ( 20.36)
   CALCULATED DISTANCE KM (MILES)         5.84 (  3.63)      6.29 (  3.91)      5.83 (  3.63)

 COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)          .18 (   .30)
   CO   GRAMS/KM (GRAMS/MILE)         2.48 (  3.99)
   CO2  GRAMS/KM (GRAMS/MILE)       282.09 (453.89)
   NOX  GRAMS/KM (GRAMS/MILE)          .09 (   .14)
   FUEL CONSUMPTION BY CB L/100KM (MPG)   12.23 ( 19.23)
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                                        TABLE      VEHICLE EMISSION RESULTS
                                                          FTP                                   PROJECT NO. 11-4746-001
VEHICLE NO.  244                                 TEST NO.        RUN
VEHICLE MODEL    78 VOLVO 244DL                  DATE  2/ 5/79                          TEST WEIGHT   1591 KG(  3500 LBS)
ENGINF 2.1 L(130 CID) L-4                        TIME 15:43                             ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
TRANSMISSION A3                                  DYNO NO.  3                            GASOLINE EM-274-3
GVW      0 KG(     -0 LBS)                       CVS NO.   2                            ODOMETER     4216
                                                 BAG CART NO.  1

BAROMETER 739.39 MM HG(29.11 IN HG)              RELATIVE HUMIDITY 48 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)            ABSOLUTE HUMIDITY  9.1 GM/KG( 63.5 GRAINS/LB)      NOX HUMIDITY C.F.  .9488

BAG RESULTS
  BAG NUMBER                                       1                        2                       3
  DESCRIPTION                                COLD TRANSIENT            STABILIZED             HOT TRANSIENT
  BLOWER DIF P MM. H2O(IN. H2O)               762.0 (30.0)           762.0 (30.0)            762.0 (30.0)
  BLOWFR INLET P MM. H2O(IN. H2O)             736.6 (29.0)           736.6 (29.0)            736.6 (29.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)            43.9 (111.0)           42.2 (108.0)            43.3 (110.0)
  BLOWER REVOLUTIONS                            40799                  69760                   40933
  CVS FLOW STD. CU. METRES(SCF)                75.8 (2676.6)         129.9 (4588.8)           76.1 (2688.7)

  HC   SAMPLE METER/RANGE/PPM                 59.0/ 2/   59           9.9/ 2/   10           14.1/ 2/   14
  HC   BCKGRD METER/RANGE/PPM                 10.3/ 2/   10           8.9/ 2/    9            8.3/ 2/    8
  CO   SAMPLE METER/RANGE/PPM                 96.0/11/  500           5.1/13/    5           50.4/13/   48
  CO   BCKGRD METER/RANGE/PPM                  1.5/11/    5           2.8/13/    3            2.8/13/    3
  CO2  SAMPLE METER/RANGE/PCT                 70.3/ 3/ 1.27          45.7/ 3/  .78           61.0/ 3/ 1.08
  CO2  BCKGRD METER/RANGE/PCT                  2.9/ 3/  .04           3.5/ 3/  .05            3.9/ 3/  .06
  NOX  SAMPLE METER/RANGE/PPM                 12.9/ 2/   13           4.3/ 2/    4            9.4/ 2/    9
  NOX  BCKGRD METER/RANGE/PPM                  1.8/ 2/    2           1.9/ 2/    2            1.9/ 2/    2

  DILUTION FACTOR                               10.12                  17.04                   12.31
  HC   CONCENTRATION PPM                          50                      2                       6
  CO   CONCENTRATION PPM                         476                      2                      44
  CO2  CONCENTRATION PCT                         1.23                   .73                    1.03
  NOX  CONCENTRATION PPM                         11.3                   2.5                     7.7

  HC   MASS GRAMS                                2.17                   .11                     .28
  CO   MASS GRAMS                               41.97                   .34                    3.88
  CO2  MASS GRAMS                              1707.5                1747.2                  1432.9
  NOX  MASS GRAMS                                1.55                   .59                    1.06

  HC   GRAMS/KM (GRAMS/MILE)                  .37 (    .59)         .02 (    .03)          .05 (    .08)
  CO   GRAMS/KM (GRAMS/MILE)                 7.10 ( 11.42)          .05 (    .09)          .67 (  1.07)
  CO2  GRA'S/KM (GRAMS/MILE)                288.7 ( 464.5)        278.5 ( 448.1)        245.4 ( 394.8)
  NOX  GRAMS/KM (GRAMS/MILE)                  .26 (    .42)         .09 (    .15)          .18 (    .29)
  FUFL CONSUMPTION BY CB L/100KM(MPG)       12.85 ( 18.31)        11.89 ( 19.78)        10.53 ( 22.35)
  CALCULATED DISTANCE KM (MILES)             5.91 (  3.68)         6.27 (  3.90)         5.84 (  3.63)

COMPOSITE FTP RESULTS
  HC   GRAMS/KM (GRAMS/MILE)              .10 (    .16)
  CO   GRAMS/KM (GRAMS/MILE)             1.69 (   2.72)
  CO2  GRAMS/KM (GRAMS/MILE)           271.53 (436.89)
  NOX  GRAMS/KM (GRAMS/MILE)              .15 (    .25)
  FUFL CONSUMPTION BY CB L/100KM (MPG)  11.72 ( 20.08)
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                          TABLE      VEHICLE EMISSION RESULTS
                                             FTPC                                          PROJECT NO. 11-4746-001

VEHICLE NO.  244                           TEST NO.        RUN                    TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO                   DATE  2/ 7/79                          ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                  TIME 10:35                             GASOLINE
TRANSMISSION                               DYNO NO.  3                            ODOMETER    4155
GVW      0 KG(     -0 LBS)                 CVS NO.   2
                                           BAG CART NO.  1

BAROMETER 745.74 MM HG(29.36 IN HG)        RELATIVE HUMIDITY 34 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)      ABSOLUTE HUMIDITY  6.4 GM/KG( 44.9 GRAINS/LB)      NOX HUMIDITY C.F.   .8760

BAG RESULTS
   BAG NUMBER                                     1                     2                     3
   DESCRIPTION                             COLD TRANSIENT          STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)            762.0 (30.0)         762.0 (30.0)         762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)          736.6 (29.0)         749.3 (29.5)         736.6 (29.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)         42.2 (108.0)         40.6 (105.0)         42.2 (108.0)
   BLOWER REVOLUTIONS                          40723                69715                40600
   CVS FLOW STD. CU. METRES(SCF)             76.6 (2704.8)       131.3 (4637.5)        76.3 (2696.2)

   HC   SAMPLE METER/RANGE/PPM              59.3/ 2/    59        9.1/ 2/     9       13.3/ 2/    13
   HC   BCKGRD METER/RANGE/PPM               7.6/ 2/     8        7.5/ 2/     8        7.5/ 2/     8
   CO   SAMPLE METER/RANGE/PPM              81.8/11/   379        3.6/13/     4       47.2/13/    45
   CO   BCKGRD METER/RANGE/PPM                .7/11/     2        1.5/13/     1        1.3/13/     1
   CO2  SAMPLE METER/RANGE/PCT              67.8/ 3/ 1.22        45.2/ 3/   .78       63.5/ 3/ 1.13
   CO2  BCKGRD METER/RANGE/PCT               3.0/ 3/   .05        3.6/ 3/   .06        3.7/ 3/   .06
   NOX  SAMPLE METER/RANGE/PPM              11.3/ 2/    11        2.3/ 2/     2        7.9/ 2/     8
   NOX  BCKGRD METER/RANGE/PPM                .4/ 2/     0         .5/ 2/     1         .8/ 2/     1

   DILUTION FACTOR                              10.62                 17.25                11.77
   HC   CONCENTRATION PPM                          52                     2                    6
   CO   CONCENTRATION PPM                         364                     2                   42
   CO2  CONCENTRATION PCT                        1.18                   .72                 1.08
   NOX  CONCENTRATION PPM                        10.9                   1.8                  7.2

   HC   MASS GRAMS                               2.32                   .15                  .28
   CO   MASS GRAMS                              32.49                   .31                 3.76
   CO2  MASS GRAMS                             1652.0                1739.4               1511.1
   NOX  MASS GRAMS                               1.40                   .40                  .92

   HC   GRAMS/KM (GRAMS/MILE)                 .40 (   .64)        .02 (   .04)        .05 (   .08)
   CO   GRAMS/KM (GRAMS/MILE)                5.58 (  8.98)        .05 (   .08)        .64 (  1.03)
   CO2  GRAMS/KM (GRAMS/MILE)               283.8 ( 456.6)      279.6 ( 449.8)      257.3 ( 414.0)
   NOX  GRAMS/KM (GRAMS/MILE)                 .24 (   .39)        .06 (   .10)        .16 (   .25)
   FUEL CONSUMPTION BY CB L/100KM(MPG)      12.54 ( 18.76)      11.94 ( 19.70)      11.03 ( 21.32)
   CALCULATED DISTANCE KM (MILES)            5.82 (  3.62)       6.22 (  3.87)       5.87 (  3.65)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)            .11 (   .18)
   CO   GRAMS/KM (GRAMS/MILE)           1.36 (  2.19)
   CO2  GRAMS/KM (GRAMS/MILE)         274.29 (441.33)
   NOX  GRAMS/KM (GRAMS/MILE)            .13 (   .20)
   FUEL CONSUMPTION BY CB L/100KM (MPG)  11.81 ( 19.91)
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                    TABLE      VEHICLE EMISSION RESULTS
                                         FTP                                        PROJECT NO. 11-4746-001

VEHICLE NO.  244                                TEST NO.        RUN               TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL    78 VOLVO  244                  DATE  2/12/79                     ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                       TIME 13:45                        GASOLINE EM-274-F
TRANSMISSION A3                                 DYNO NO.  3                       ODOMETER    4196
GVW      0 KG(     -0 LBS)                      CVS NO.   2
                                                BAG CART NO.  1

BAROMETER 745.74 MM HG(29.36 IN HG)             RELATIVE HUMIDITY 39 PCT
DRY BULB TEMP. 27.2 DEG C(81.0 DEG F)           ABSOLUTE HUMIDITY  8.9 GM/KG( 62.3 GRAINS/LB)      NOX HUMIDITY C.F.  .9435

BAG RESULTS
  BAG NUMBER                                         1                    2                    3
  DESCRIPTION                                 COLD TRANSIENT         STABILIZED          HOT TRANSIENT
  BLOWER DIF P MM. H2O(IN. H2O)               762.0 (30.0)         762.0 (30.0)         762.0 (30.0)
  BLOWER INLET P MM. H2O(IN. H2O)             736.6 (29.0)         736.6 (29.0)         736.6 (29.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)            43.9 (111.0)         43.3 (110.0)         43.3 (110.0)
  BLOWER REVOLUTIONS                             40924                69772                41267
  CVS FLOW STD. CU. METRES(SCF)                76.8 (2710.8)       130.9 (4624.1)        77.5 (2737.5)

  HC  SAMPLE METER/RANGE/PPM                  54.7/ 2/   55        12.0/ 2/   12        15.5/ 2/   15
  HC  BCKGRD METER/RANGE/PPM                   9.4/ 2/    9         9.6/ 2/   10        10.4/ 2/   10
  CO  SAMPLE METER/RANGE/PPM                  74.9/11/  330         4.1/13/    4        57.7/13/   55
  CO  BCKGRD METER/RANGE/PPM                    .8/11/    2         3.0/13/    3         1.9/13/    2
  CO2 SAMPLE METER/RANGE/PCT                  66.7/ 3/ 1.20        43.0/ 3/  .73        57.9/ 3/ 1.02
  CO2 BCKGRD METER/RANGE/PCT                   3.0/ 3/  .05         3.5/ 3/  .05         2.8/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                  11.0/ 2/   11         4.2/ 2/    4         7.6/ 2/    8
  NOX BCKGRD METER/RANGE/PPM                   1.9/ 2/    2         2.3/ 2/    2         2.3/ 2/    2

  DILUTION FACTOR                                10.85                18.22                13.03
  HC  CONCENTRATION PPM                            46                    3                    6
  CO  CONCENTRATION PPM                           316                    1                   52
  CO2 CONCENTRATION PCT                           1.16                  .68                  .98
  NOX CONCENTRATION PPM                           9.3                   2.0                  5.5

  HC  MASS GRAMS                                  2.04                  .22                  .26
  CO  MASS GRAMS                                 28.28                  .18                 4.69
  CO2 MASS GRAMS                                1624.2               1637.9               1393.6
  NOX MASS GRAMS                                  1.28                  .48                  .77

  HC  GRAMS/KM (GRAMS/MILE)                    .35 (   .56)         .04 (   .06)         .05 (   .07)
  CO  GRAMS/KM (GRAMS/MILE)                   4.79 (  7.70)         .03 (   .05)         .80 (  1.29)
  CO2 GRAMS/KM (GRAMS/MILE)                  274.8 ( 442.2)       259.9 ( 418.2)       239.3 ( 385.0)
  NOX GRAMS/KM (GRAMS/MILE)                    .22 (   .35)         .08 (   .12)         .13 (   .21)
  FUEL CONSUMPTION BY CB L/100KM(MPG)        12.10 ( 19.45)       11.10 ( 21.20)       10.27 ( 22.90)
  CALCULATED DISTANCE KM (MILES)              5.91 (  3.67)        6.30 (  3.92)        5.82 (  3.62)

COMPOSITE FTP RESULTS
  HC  GRAMS/KM (GRAMS/MILE)            .10 (   .16)
  CO  GRAMS/KM (GRAMS/MILE)           1.23 (  1.98)
  CO2 GRAMS/KM (GRAMS/MILE)         257.35 (414.08)
  NOX GRAMS/KM (GRAMS/MILE)            .12 (   .19)
  FUEL CONSUMPTION BY CB L/100KM (MPG)   11.09 ( 21.23)
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                                  TABLE      VEHICLE EMISSION RESULTS
                                                    FTP SET                                          PROJECT NO. 11-4746-001
VEHICLE NO. 244
VEHICLE MODEL    78 VOLVO 244-DL                   TEST NO.           RUN                 TEST WEIGHT    1591 KG(  3500 LBS)
ENGINE 2.1 L(130 CID) L-4                          DATE  3/ 1/79                          ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
TRANSMISSION A3                                    TIME 14152                             GASOLINE
GVW      0 KG(     -0 LBS)                         DYNO NO.  3                            ODOMETER     4659
                                                   CVS NO.   2
                                                   BAG CART NO.  1

BAROMETER 739.90 MM HG(29.13 IN HG)                RELATIVE HUMIDITY 38 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)              ABSOLUTE HUMIDITY  7.1 GM/KG( 49.8 GRAINS/LB)      NOX HUMIDITY C.F.  .8942

BAG RESULTS
   BAG NUMBER                                         1                    2                    3                     4
   DESCRIPTION                                 COLD TRANSIENT          STABILIZED         HOT TRANSIENT              SET-7
   BLOWER DIF P MM. H2O(IN. H2O)               749.3 (29.5)         749.3 (29.5)         749.3 (29.5)          749.3 (29.5)
   BLOWER INLET P MM. H2O(IN. H2O)             723.9 (28.5)         723.9 (28.5)         723.9 (28.5)          723.9 (28.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)            43.3 (110.0)         43.3 (110.0)         43.3 (110.0)          43.3 (110.0)
   BLOWER REVOLUTIONS                              40678                69628                40796                112380
   CVS FLOW STD. CU. METRES(SCF)                75.8 (2677.7)       129.8 (4582.9)        76.0 (2685.3)        209.4 (7396.4)

   HC   SAMPLE METER/RANGE/PPM                 10.8/ 3/  108        13.4/ 2/   13        22.8/ 2/   23         25.6/ 2/   26
   HC   BCKGRD METER/RANGE/PPM                  1.3/ 3/   13        11.6/ 2/   12        12.5/ 2/   13         21.9/ 2/   22
   CO   SAMPLE METER/RANGE/PPM                 88.4/11/  432        21.3/13/   20        78.7/13/   78         87.2/13/   88
   CO   BCKGRD METER/RANGE/PPM                  1.6/11/    5         3.2/13/    3         2.5/13/    2          1.7/13/    2
   CO2  SAMPLE METER/RANGE/PCT                 76.4/ 3/ 1.40        47.8/ 3/  .82        63.1/ 3/ 1.12         74.0/ 3/ 1.35
   CO2  BCKGRD METER/RANGE/PCT                  3.6/ 3/  .06         4.0/ 3/  .06         3.8/ 3/  .06          4.0/ 3/  .06
   NOX  SAMPLE METER/RANGE/PPM                 12.1/ 2/   12         5.2/ 2/    5         6.3/ 2/    6          5.8/ 2/    6
   NOX  BCKGRD METER/RANGE/PPM                  1.4/ 2/    1         1.5/ 2/    2         1.8/ 2/    2          1.1/ 2/    1

   DILUTION FACTOR                                 9.26                16.18                11.81                  9.88
   HC   CONCENTRATION PPM                           96                    3                   11                     6
   CO   CONCENTRATION PPM                          410                   17                   73                    83
   CO2  CONCENTRATION PCT                          1.35                 .77                 1.07                  1.29
   NOX  CONCENTRATION PPM                          10.9                 3.8                  4.7                   4.8

   HC   MASS GRAMS                                 4.22                 .19                  .50                   .71
   CO   MASS GRAMS                                36.23                2.54                 6.47                 20.17
   CO2  MASS GRAMS                               1868.9               1823.2               1491.8                4950.1
   NOX  MASS GRAMS                                 1.41                 .84                  .61                  1.72

   HC   GRAMS/KM (GRAMS/MILE)                  .73 (  1.17)         .03 (   .05)         .09 (   .14)          .03 (   .05)
   CO   GRAMS/KM (GRAMS/MILE)                 6.28 ( 10.10)         .40 (   .65)        1.12 (  1.80)          .93 (  1.49)
   CO2  GRAMS/KM (GRAMS/MILE)                323.7 ( 520.9)       291.0 ( 468.2)       258.4 ( 415.8)        228.0 ( 366.9)
   NOX  GRAMS/KM (GRAMS/MILE)                  .24 (   .39)         .13 (   .22)         .10 (   .17)          .08 (   .13)
   FUEL CONSUMPTION BY CB L/100KM(MPG)       14.34 ( 16.41)       12.45 ( 18.89)       11.12 ( 21.16)         9.80 ( 24.01)
   CALCULATED DISTANCE KM (MILES)             5.77 (  3.59)        6.27 (  3.89)        5.77 (  3.59)        21.71 ( 13.49)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)             .19 (   .31)
   CO   GRAMS/KM (GRAMS/MILE)            1.81 (  2.91)
   CO2  GRAMS/KM (GRAMS/MILE)          288.84 (464.75)
   NOX  GRAMS/KM (GRAMS/MILE)             .15 (   .24)
   FUEL CONSUMPTION BY CB L/100KM (MPG) 12.48 ( 18.86)

COMBINED FUEL ECONOMY L/100KM (MPG)     11.27 ( 20.87)
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                             TABLE      VEHICLE EMISSION RESULTS
                                                  FTP                                   PROJECT NO. 11-4746-001

VEHICLE NO.  244                                  TEST NO.        RUN               TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                    DATE  3/ 5/79                     ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                         TIME 13:30                        GASOLINE
TRANSMISSION A3                                   DYNO NO.  3                       ODOMETER    4691
GVW      0 KG(    -0 LBS)                         CVS NO.  2
                                                  BAG CART NO.  1

BAROMETER 748.03 MM HG(29.45 IN HG)               RELATIVE HUMIDITY 22 PCT
DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)             ABSOLUTE HUMIDITY  4.5 GM/KG( 31.4 GRAINS/LB)      NOX HUMIDITY C.F.   .8298

BAG RESULTS
   BAG NUMBER                                            1                    2                    3
   DESCRIPTION                                    COLD TRANSIENT          STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                   749.3 (29.5)         749.3 (29.5)         749.3 (29.5)
   BLOWER INLET P MM. H2O(IN. H2O)                 723.9 (28.5)         723.9 (28.5)         723.9 (28.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)                46.1 (115.0)         42.2 (108.0)         43.3 (110.0)
   BLOWER REVOLUTIONS                                  40661                69694                40550
   CVS FLOW STD. CU. METRES(SCF)                    76.7 (2710.8)       131.7 (4652.1)        76.5 (2701.4)

   HC   SAMPLE METER/RANGE/PPM                     75.3/ 2/    75       12.5/ 2/    13       22.2/ 2/    22
   HC   BCKGRD METER/RANGE/PPM                     11.0/ 2/    11       10.9/ 2/    11        9.5/ 2/    10
   CO   SAMPLE METER/RANGE/PPM                     81.5/11/   377       13.8/13/    13       72.2/13/    71
   CO   BCKGRD METER/RANGE/PPM                      1.1/11/     3        3.8/13/     4        2.5/13/     2
   CO2  SAMPLE METER/RANGE/PCT                     66.5/ 3/  1.19       43.5/ 3/   .74       60.9/ 3/  1.08
   CO2  BCKGRD METER/RANGE/PCT                      3.3/ 3/   .05        3.6/ 3/   .06        3.6/ 3/   .06
   NOX  SAMPLE METER/RANGE/PPM                     12.0/ 2/    12        4.7/ 2/     5        5.8/ 2/     6
   NOX  BCKGRD METER/RANGE/PPM                       .8/ 2/     1         .7/ 2/     1         .7/ 2/     1

   DILUTION FACTOR                                    10.83                17.97                12.29
   HC   CONCENTRATION PPM                              65                    2                   13
   CO   CONCENTRATION PPM                             363                    9                   67
   CO2  CONCENTRATION PCT                             1.15                  .69                 1.03
   NOX  CONCENTRATION PPM                             11.3                  4.0                  5.2

   HC   MASS GRAMS                                    2.89                  .17                  .59
   CO   MASS GRAMS                                   32.42                 1.45                 5.92
   CO2  MASS GRAMS                                  1612.6               1667.1               1442.9
   NOX  MASS GRAMS                                    1.37                  .84                  .63

   HC   GRAMS/KM (GRAMS/MILE)                      .49 (   .79)         .03 (   .04)         .10 (   .16)
   CO   GRAMS/KM (GRAMS/MILE)                     5.51 (  8.87)         .23 (   .38)        1.01 (  1.62)
   CO2  GRAMS/KM (GRAMS/MILE)                    274.1 ( 441.0)       268.6 ( 432.1)       245.2 ( 394.6)
   NOX  GRAMS/KM (GRAMS/MILE)                      .23 (   .38)         .14 (   .22)         .11 (   .17)
   FUEL CONSUMPTION BY CB L/100KM(MPG)           12.13 ( 19.39)       11.48 ( 20.49)       10.55 ( 22.30)
   CALCULATED DISTANCE KM (MILES)                 5.88 (  3.66)        6.21 (  3.86)        5.88 (  3.66)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)             .14 (   .23)
   CO   GRAMS/KM (GRAMS/MILE)            1.55 (  2.50)
   CO2  GRAMS/KM (GRAMS/MILE)          263.25 (423.56)
   NOX  GRAMS/KM (GRAMS/MILE)             .15 (   .24)
   FUEL CONSUMPTION BY CB L/100KM (MPG)  11.36 ( 20.71)
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                                    TABLE      VEHICLE EMISSION RESULTS                              PROJECT NO. 11-4746-001
                                                         FTP
                                                                                        TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE NO.  244                               TEST NO.        RUN                      ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
VEHICLE MODEL   78 VOLVO  244DL                DATE  3/ 6/79                            GASOLINE
ENGINE 2.1 L(130 CID) L-4                      TIME 13120                               ODOMETER      -0
TRANSMISSION A3                                DYNO NO.  3
GVW     0 KG(    -0 LBS)                       CVS NO.   2
                                               BAG CART NO.  1

BAROMETER 745.49 MM HG(29.35 IN HG)            RELATIVE HUMIDITY 34 PCT
DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)          ABSOLUTE HUMIDITY  5.6 GM/KG( 39.1 GRAINS/LB)      NOX HUMIDITY C.F.  .8555

BAG RESULTS
   BAG NUMBER                                         1                    2                    3
   DESCRIPTION                                 COLD TRANSIENT         STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                762.0 (30.0)         762.0 (30.0)         762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)              736.6 (29.0)         736.6 (29.0)         736.6 (29.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)             43.3 (110.0)         43.3 (110.0)         43.3 (110.0)
   BLOWER REVOLUTIONS                              40615                69641                40561
   CVS FLOW STD. CU. METRES(SCF)                 76.2 (2690.8)       130.6 (4613.5)        76.1 (2687.1)

   HC   SAMPLE METER/RANGE/PPM                 63.3/ 2/   63         12.5/ 2/   13        18.5/ 2/   18
   HC   BCKGRD METER/RANGE/PPM                 11.5/ 2/   11         11.3/ 2/   11        10.5/ 2/   10
   CO   SAMPLE METER/RANGE/PPM                 79.1/11/  360         11.3/13/   11        35.0/13/   33
   CO   BCKGRD METER/RANGE/PPM                  1.2/11/    4          3.3/13/    3         2.7/13/    3
   CO2  SAMPLE METER/RANGE/PCT                 67.4/ 3/ 1.21         46.2/ 3/  .79        61.4/ 3/ 1.09
   CO2  BCKGRD METER/RANGE/PCT                  3.6/ 3/  .06          3.9/ 3/  .06         3.7/ 3/  .06
   NOX  SAMPLE METER/RANGE/PPM                 12.1/ 2/   12          4.9/ 2/    5         5.0/ 2/    5
   NOX  BCKGRD METER/RANGE/PPM                   .8/ 2/    1           .7/ 2/    1          .5/ 2/    1

   DILUTION FACTOR                                10.70                16.82                12.23
   HC   CONCENTRATION PPM                            53                    8                    9
   CO   CONCENTRATION PPM                           344                    8                   30
   CO2  CONCENTRATION PCT                          1.16                  .74                 1.04
   NOX  CONCENTRATION PPM                          11.4                  4.2                  4.5

   HC   MASS GRAMS                                 2.32                  .14                  .39
   CO   MASS GRAMS                                30.51                 1.16                 2.63
   CO2  MASS GRAMS                               1620.4               1765.5               1447.2
   NOX  MASS GRAMS                                 1.42                  .91                  .57

   HC   GRAMS/KM (GRAMS/MILE)                  .40 (   .64)         .02 (   .04)         .07 (   .11)
   CO   GRAMS/KM (GRAMS/MILE)                 5.21 (  8.38)         .19 (   .30)         .45 (   .72)
   CO2  GRAMS/KM (GRAMS/MILE)                276.4 ( 444.8)       284.2 ( 457.3)       246.4 ( 396.4)
   NOX  GRAMS/KM (GRAMS/MILE)                  .24 (   .39)         .15 (   .23)         .10 (   .15)
   FUEL CONSUMPTION BY CB L/100KM(MPG)       12.20 ( 19.28)       12.15 ( 19.37)       10.55 ( 22.29)
   CALCULATED DISTANCE KM (MILES)             5.86 (  3.64)        6.21 (  3.86)        5.87 (  3.65)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)             .11 (   .18)
   CO   GRAMS/KM (GRAMS/MILE)            1.31 (  2.10)
   CO2  GRAMS/KM (GRAMS/MILE)          272.11 (437.83)
   NOX  GRAMS/KM (GRAMS/MILE)             .15 (   .24)
   FUEL CONSUMPTION BY CB L/100KM (MPG) 11.72 ( 20.08)
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                           TABLE      VEHICLE EMISSION RESULTS
                                                 FTP                                          PROJECT NO. 11-4746-001

VEHICLE NO.  244                                  TEST NO.          RUN                       TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL    78 VOLVO 244DL                   DATE  3/12/79                               ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                         TIME 09:17                                  GASOLINE
TRANSMISSION A3                                   DYNO NO.  3                                 ODOMETER     4721
GVW      0 KG(     -0 LBS)                        CVS NO.   2
                                                  BAG CART NO.  1

BAROMETER 747.78 MM HG(29.44 IN HG)               RELATIVE HUMIDITY 31 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)             ABSOLUTE HUMIDITY  5.8 GM/KG( 40.5 GRAINS/LB)      NOX HUMIDITY C.F.  .8603

BAG RESULTS
  BAG NUMBER                                           1                    2                    3
  DESCRIPTION                                   COLD TRANSIENT         STABILIZED          HOT TRANSIENT
  BLOWER DIF P MM. H2O(IN. H2O)                  762.0 (30.0)        762.0 (30.0)        762.0 (30.0)
  BLOWER INLET P MM. H2O(IN. H2O)                736.6 (29.0)        736.6 (29.0)        736.6 (29.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)               42.8 (109.0)        42.2 (108.0)        43.3 (110.0)
  BLOWER REVOLUTIONS                                40649               69769               40581
  CVS FLOW STD. CU. METRES(SCF)                   76.6 (2705.1)      131.6 (4647.1)       76.4 (2697.6)

  HC   SAMPLE METER/RANGE/PPM                    81.2/ 2/   81        13.2/ 2/   13        15.0/ 2/   15
  HC   BCKGRD METER/RANGE/PPM                    10.7/ 2/   11        11.2/ 2/   11        11.3/ 2/   11
  CO   SAMPLE METER/RANGE/PPM                    80.5/11/  370        14.5/13/   14        28.2/13/   27
  CO   BCKGRD METER/RANGE/PPM                     2.5/11/    8         8.1/13/    8         3.8/13/    4
  CO2  SAMPLE METER/RANGE/PCT                    67.1/ 3/ 1.21        44.0/ 3/  .75        61.9/ 3/ 1.10
  CO2  BCKGRD METER/RANGE/PCT                     4.0/ 3/  .06         4.0/ 3/  .06         3.6/ 3/  .06
  NOX  SAMPLE METER/RANGE/PPM                    11.5/ 2/   11         5.0/ 2/    5         5.5/ 2/    6
  NOX  BCKGRD METER/RANGE/PPM                     1.9/ 2/    2         1.7/ 2/    2         1.0/ 2/    1

  DILUTION FACTOR                                   10.73               17.74               12.13
  HC   CONCENTRATION PPM                              71                   3                   5
  CO   CONCENTRATION PPM                             351                   6                  22
  CO2  CONCENTRATION PCT                             1.15                .69                1.05
  NOX  CONCENTRATION PPM                              9.8                3.4                 4.6

  HC   MASS GRAMS                                    3.16                .20                 .20
  CO   MASS GRAMS                                   31.27                .95                2.00
  CO2  MASS GRAMS                                  1612.5             1673.9              1468.9
  NOX  MASS GRAMS                                    1.23                .74                 .58

  HC   GRAMS/KM (GRAMS/MILE)                     .55 (   .89)        .03 (   .05)        .04 (   .06)
  CO   GRAMS/KM (GRAMS/MILE)                    5.48 (  8.82)        .15 (   .25)        .35 (   .57)
  CO2  GRAMS/KM (GRAMS/MILE)                   282.8 ( 454.9)      270.3 ( 434.9)      258.3 ( 415.6)
  NOX  GRAMS/KM (GRAMS/MILE)                     .22 (   .35)        .12 (   .19)        .10 (   .16)
  FUEL CONSUMPTION BY CB L/100KM(MPG)          12.51 ( 18.80)      11.55 ( 20.37)      11.05 ( 21.28)
  CALCULATED DISTANCE KM (MILES)                5.70 (  3.54)       6.19 (  3.85)       5.69 (  3.53)

COMPOSITE FTP RESULTS
  HC   GRAMS/KM (GRAMS/MILE)               .14 (   .23)
  CO   GRAMS/KM (GRAMS/MILE)              1.31 (  2.10)
  CO2  GRAMS/KM (GRAMS/MILE)            269.58 (433.76)
  NOX  GRAMS/KM (GRAMS/MILE)               .13 (   .22)
  FUEL CONSUMPTION BY CB L/100KM (MPG)   11.61 ( 20.26)
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                              TABLE       VEHICLE EMISSION RESULTS
                                                FTP  SET                                  PROJECT NO. 11-4746-001

VEHICLE NO.  244                                 TEST NO.        RUN                   TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                   DATE  3/16/79                         ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                        TIME                                  GASOLINE
TRANSMISSION A3                                  DYNO NO.  3                           ODOMETER       -0
GVW      0 KG(    -0 LBS)                        CVS NO.   2
                                                 BAG CART NO.  1

BAROMETER 744.98 MM HG(29.33 IN HG)              RELATIVE HUMIDITY 42 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)            ABSOLUTE HUMIDITY  8.5 GM/KG( 59.5 GRAINS/LB)      NOX HUMIDITY C.F.  .9322

BAG RESULTS
   BAG NUMBER                                   1                   2                  3                   4
   DESCRIPTION                           COLD TRANSIENT         STABILIZED        HOT TRANSIENT          SET-7
   BLOWER DIF P MM. H2O(IN. H2O)          762.0 (30.0)        762.0 (30.0)       762.0 (30.0)        762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)        749.3 (29.5)        749.3 (29.5)       749.3 (29.5)        749.3 (29.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)       43.3 (110.0)        42.2 (108.0)       43.3 (110.0)        43.3 (110.0)
   BLOWER REVOLUTIONS                        40567               69645              40699               112257
   CVS FLOW STD. CU. METRES(SCF)          75.9 (2682.0)      130.6 (4612.9)     76.2 (2690.4)       210.1 (7420.8)

   HC   SAMPLE METER/RANGE/PPM            70.9/ 2/   71       11.5/ 2/   11      16.7/ 2/   17       18.6/ 2/   19
   HC   BCKGRD METER/RANGE/PPM            12.1/ 2/   12       13.2/ 2/   13      15.0/ 2/   15       22.9/ 2/   23
   CO   SAMPLE METER/RANGE/PPM            81.4/11/  376        8.6/13/    8      26.1/13/   25       65.2/13/   63
   CO   BCKGRD METER/RANGE/PPM             3.2/11/   10        6.6/13/    6       5.2/13/    5        3.1/13/    3
   CO2  SAMPLE METER/RANGE/PCT            70.7/ 3/ 1.28       45.9/ 3/  .79      62.8/ 3/ 1.12       72.3/ 3/ 1.31
   CO2  BCKGRD METER/RANGE/PCT             3.7/ 3/  .06        3.8/ 3/  .06       3.9/ 3/  .06        3.6/ 3/  .06
   NOX  SAMPLE METER/RANGE/PPM            10.0/ 2/   10        3.2/ 2/    3       5.1/ 2/    5        5.8/ 2/    6
   NOX  BCKGRD METER/RANGE/PPM              .5/ 2/    1         .4/ 2/    0        .4/ 2/    0        1.1/ 2/    1

   DILUTION FACTOR                           10.14               16.95              11.93               10.16
   HC   CONCENTRATION PPM                      60                  -1                  3                  -2
   CO   CONCENTRATION PPM                     353                   2                 19                  58
   CO2  CONCENTRATION PCT                    1.23                 .73               1.06                1.26
   NOX  CONCENTRATION PPM                     9.5                 2.8                4.7                 4.8

   HC   MASS GRAMS                           2.63                -.07                .13                -.25
   CO   MASS GRAMS                          31.23                 .32               1.71               14.20
   CO2  MASS GRAMS                         1706.7              1755.1             1484.2              4853.3
   NOX  MASS GRAMS                           1.29                 .66                .64                1.80

   HC   GRAMS/KM (GRAMS/MILE)             .46 (   .74)       -.01 (  -.02)       .02 (   .04)       -.01 (  -.02)
   CO   GRAMS/KM (GRAMS/MILE)            5.45 (  8.76)        .05 (   .09)       .30 (   .49)        .66 (  1.06)
   CO2  GRAMS/KM (GRAMS/MILE)           297.6 ( 478.9)      288.4 ( 464.0)     261.8 ( 421.2)      226.1 ( 363.9)
   NOX  GRAMS/KM (GRAMS/MILE)             .23 (   .36)        .11 (   .17)       .11 (   .18)        .08 (   .14)
   FUEL CONSUMPTION BY CB L/100KM(MPG)  13.13 ( 17.92)      12.31 ( 19.11)     11.20 ( 21.01)       9.69 ( 24.27)
   CALCULATED DISTANCE KM (MILES)        5.73 (  3.56)       6.09 (  3.78)      5.67 (  3.52)      21.46 ( 13.34)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)             .10 (   .15)
   CO   GRAMS/KM (GRAMS/MILE)            1.25 (  2.01)
   CO2  GRAMS/KM (GRAMS/MILE)          283.00 (455.35)
   NOX  GRAMS/KM (GRAMS/MILE)             .13 (   .22)
   FUEL CONSUMPTION BY CB L/100KM (MPG) 12.18 ( 19.32)

COMBINED FUEL ECONOMY L/100KM (MPG)     11.06 ( 21.27)
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                        TABLE      VEHICLE EMISSION RESULTS
                                          FTP                                        PROJECT NO. 11-4746-001

VEHICLE NO.  244                               TEST NO.        RUN                   TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                 DATE  3/19/79                         ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                      TIME 13123                            GASOLINE
TRANSMISSION A3                                DYNO NO.  3                           ODOMETER    5196
GVW      0 KG(    -0 LBS)                      CVS NO.  2
                                               BAG CART NO.  1

BAROMETER 736.85 MM HG(29.01 IN HG)            RELATIVE HUMIDITY 73 PCT
DRY BULB TEMP. 29.4 DEG C(85.0 DEG F)          ABSOLUTE HUMIDITY 19.7 GM/KG(137.8 GRAINS/LB)      NOX HUMIDITY C.F. 1.4185

BAG RESULTS
   BAG NUMBER                                        1                    2                    3
   DESCRIPTION                                COLD TRANSIENT         STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)              762.0 (30.0)         762.0 (30.0)         762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)            749.3 (29.5)         749.3 (29.5)         749.3 (29.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)           41.7 (107.0)         40.6 (105.0)         43.3 (110.0)
   BLOWER REVOLUTIONS                            40615                69647                40573
   CVS FLOW STD. CU. METRES(SCF)              75.3 (2660.5)       129.4 (4571.4)       75.0 (2649.8)

   HC  SAMPLE METER/RANGE/PPM                 68.1/ 2/   68        15.3/ 2/   15        23.7/ 2/   24
   HC  BCKGRD METER/RANGE/PPM                 12.5/ 2/   13        13.4/ 2/   13        17.8/ 2/   18
   CO  SAMPLE METER/RANGE/PPM                 98.4/11/  523        65.5/13/   64        73.9/13/   73
   CO  BCKGRD METER/RANGE/PPM                   .8/11/    2         2.3/13/    2         2.2/13/    2
   CO2 SAMPLE METER/RANGE/PCT                 69.3/ 3/ 1.25        46.9/ 3/  .81        65.3/ 3/ 1.17
   CO2 BCKGRD METER/RANGE/PCT                  3.7/ 3/  .06         4.0/ 3/  .06         3.9/ 3/  .06
   NOX SAMPLE METER/RANGE/PPM                  7.6/ 2/    8          .9/ 2/    1         2.2/ 2/    2
   NOX BCKGRD METER/RANGE/PPM                  1.6/ 2/    2          .6/ 2/    1          .6/ 2/    1

   DILUTION FACTOR                                10.26                16.44                11.37
   HC  CONCENTRATION PPM                           57                    3                    7
   CO  CONCENTRATION PPM                          496                   59                   67
   CO2 CONCENTRATION PCT                          1.20                  .75                 1.11
   NOX CONCENTRATION PPM                          6.2                   .3                  1.7

   HC  MASS GRAMS                                 2.47                  .20                  .32
   CO  MASS GRAMS                                43.50                 8.89                 5.88
   CO2 MASS GRAMS                               1653.6               1777.8               1531.1
   NOX MASS GRAMS                                 1.26                  .12                  .34

   HC  GRAMS/KM (GRAMS/MILE)                  .43 (   .69)         .03 (   .05)         .06 (   .09)
   CO  GRAMS/KM (GRAMS/MILE)                 7.55 ( 12.15)        1.46 (  2.35)        1.03 (  1.65)
   CO2 GRAMS/KM (GRAMS/MILE)                287.0 ( 461.8)       292.0 ( 469.9)       267.5 ( 430.4)
   NOX GRAMS/KM (GRAMS/MILE)                  .22 (   .35)         .02 (   .03)         .06 (   .09)
   FUEL CONSUMPTION BY CB L/100KM(MPG)      12.81 ( 18.36)       12.57 ( 18.72)       11.49 ( 20.47)
   CALCULATED DISTANCE KM (MILES)            5.76 (  3.58)        6.09 (  3.78)        5.72 (  3.56)

COMPOSITE FTP RESULTS
   HC  GRAMS/KM (GRAMS/MILE)             .12 (   .20)
   CO  GRAMS/KM (GRAMS/MILE)            2.61 (  4.21)
   CO2 GRAMS/KM (GRAMS/MILE)          284.21 (457.30)
   NOX GRAMS/KM (GRAMS/MILE)             .07 (   .12)
   FUEL CONSUMPTION BY CB L/100KM (MPG)    12.32 ( 19.09)
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                              TABLE      VEHICLE EMISSION RESULTS
                                                FTP                                    PROJECT NO. 11-4746-001

VEHICLE NO.  244                             TEST NO.        RUN              TEST WEIGHT    1591 KG( 3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL               DATE  3/20/79                    ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                    TIME 13:45                       GASOLINE
TRANSMISSION A3                              DYNO NO.  3                      ODOMETER     5207
GVW     0 KG(    -0 LBS)                     CVS NO.   2
                                             BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)          RELATIVE HUMIDITY 46 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)        ABSOLUTE HUMIDITY  9.3 GM/KG( 64.9 GRAINS/LB)      NOX HUMIDITY C.F.  .9549

BAG RESULTS
  BAG NUMBER                                      1                   2                   3
  DESCRIPTION                              COLD TRANSIENT        STABILIZED         HOT TRANSIENT
  BLOWER DIF P MM. H2O(IN. H2O)            787.4 (31.0)        787.4 (31.0)        787.4 (31.0)
  BLOWER INLET P MM. H2O(IN. H2O)          762.0 (30.0)        762.0 (30.0)        762.0 (30.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)         43.3 (110.0)        43.3 (110.0)        43.3 (110.0)
  BLOWER REVOLUTIONS                           40673               69790               40448
  CVS FLOW STD. CU. METRES(SCF)             75.3 (2659.5)      129.1 (4559.5)       74.9 (2644.5)

  HC  SAMPLE METER/RANGE/PPM               67.3/ 2/   67       14.3/ 2/   14       26.3/ 2/   26
  HC  BCKGRD METER/RANGE/PPM                9.1/ 2/    9       10.0/ 2/   10       11.9/ 2/   12
  CO  SAMPLE METER/RANGE/PPM               94.4/11/  484       64.0/13/   62       70.2/13/   69
  CO  BCKGRD METER/RANGE/PPM                4.6/11/   14       14.6/13/   14       12.0/13/   12
  CO2 SAMPLE METER/RANGE/PCT               69.4/ 3/ 1.25       48.2/ 3/  .83       65.8/ 3/ 1.18
  CO2 BCKGRD METER/RANGE/PCT                3.7/ 3/  .06        4.7/ 3/  .07        4.7/ 3/  .07
  NOX SAMPLE METER/RANGE/PPM                7.7/ 2/    8        1.2/ 2/    1        2.7/ 2/    3
  NOX BCKGRD METER/RANGE/PPM                1.3/ 2/    1        1.1/ 2/    1         .9/ 2/    1

  DILUTION FACTOR                             10.27               15.95               11.28
  HC  CONCENTRATION PPM                        59                   5                  15
  CO  CONCENTRATION PPM                       453                  47                  56
  CO2 CONCENTRATION PCT                       1.20                 .76                1.11
  NOX CONCENTRATION PPM                        6.5                  .2                 1.9

  HC  MASS GRAMS                              2.57                 .37                 .67
  CO  MASS GRAMS                             39.72                7.08                4.85
  CO2 MASS GRAMS                            1655.8              1808.0              1526.4
  NOX MASS GRAMS                               .90                 .04                 .26

  HC  GRAMS/KM (GRAMS/MILE)                 .44 (   .71)        .06 (   .10)        .12 (   .19)
  CO  GRAMS/KM (GRAMS/MILE)                6.85 ( 11.02)       1.14 (  1.84)        .84 (  1.36)
  CO2 GRAMS/KM (GRAMS/MILE)               285.5 ( 459.4)      292.0 ( 469.8)      265.6 ( 427.3)
  NOX GRAMS/KM (GRAMS/MILE)                 .15 (   .25)        .01 (   .01)        .04 (   .07)
  FUEL CONSUMPTION BY CB L/100KM(MPG)     12.71 ( 18.51)      12.55 ( 18.75)      11.41 ( 20.62)
  CALCULATED DISTANCE KM (MILES)           5.80 (  3.60)       6.19 (  3.85)       5.75 (  3.57)

COMPOSITE FTP RESULTS
  HC  GRAMS/KM (GRAMS/MILE)            .15 (   .25)
  CO  GRAMS/KM (GRAMS/MILE)           2.25 (  3.62)
  CO2 GRAMS/KM (GRAMS/MILE)         283.41 (456.01)
  NOX GRAMS/KM (GRAMS/MILE)            .05 (   .08)
  FUEL CONSUMPTION BY CB L/100KM (MPG)   12.27 ( 19.17)
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                         TABLE      VEHICLE EMISSION RESULTS
                                            FTP
                                                                                    PROJECT NO. 11-4746-001
VEHICLE NO.  244                                 TEST NO.         RUN                  TEST WEIGHT    1591 KG(  3500 LBS)
VEHICLE MODEL    78 VOLVO 244DL                  DATE  4/17/79                         ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                        TIME 13:15                            GASOLINE EM-274-F
TRANSMISSION A3                                  DYNO NO.  3                           ODOMETER     9627
GVW      0 KG(    -0 LBS)                        CVS NO.   2
                                                 BAG CART NO.  1

BAROMETER 739.90 MM HG(29.13 IN HG)              RELATIVE HUMIDITY 48 PCT
DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)            ABSOLUTE HUMIDITY 10.7 GM/KG( 74.7 GRAINS/LB)      NOX HUMIDITY C.F.   .9986

BAG RESULTS
   BAG NUMBER                                         1                      2                      3
   DESCRIPTION                                  COLD TRANSIENT          STABILIZED            HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                774.7 (30.5)           774.7 (30.5)           774.7 (30.5)
   BLOWER INLET P MM. H2O(IN. H2O)              762.0 (30.0)           762.0 (30.0)           762.0 (30.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)            42.8 (109.0)           42.2 (108.0)           43.3 (110.0)
   BLOWER REVOLUTIONS                              40602                  69695                  40550
   CVS FLOW STD. CU. METRES(SCF)               75.4 (2661.6)          129.5 (4572.9)         75.2 (2655.3)

   HC   SAMPLE METER/RANGE/PPM                 59.0/ 2/    59         16.3/ 2/    16         18.5/ 2/    18
   HC   BCKGRD METER/RANGE/PPM                 12.9/ 2/    13         14.6/ 2/    15         16.3/ 2/    16
   CO   SAMPLE METER/RANGE/PPM                 76.0/11/   338         11.4/13/    11         31.8/13/    30
   CO   BCKGRD METER/RANGE/PPM                  1.4/11/     4          4.6/13/     4          3.4/13/     3
   CO2  SAMPLE METER/RANGE/PCT                 71.1/ 3/  1.29         46.9/ 3/   .81         64.3/ 3/  1.15
   CO2  BCKGRD METER/RANGE/PCT                  3.5/ 3/   .05          4.0/ 3/   .06          3.4/ 3/   .05
   NOX  SAMPLE METER/RANGE/PPM                 11.4/ 2/    11          3.6/ 2/     4          4.8/ 2/     5
   NOX  BCKGRD METER/RANGE/PPM                  1.3/ 2/     1          1.0/ 2/     1           .6/ 2/     1

   DILUTION FACTOR                                 10.11                  16.54                  11.62
   HC   CONCENTRATION PPM                             47                      3                      4
   CO   CONCENTRATION PPM                            321                      6                     26
   CO2  CONCENTRATION PCT                           1.24                    .75                   1.10
   NOX  CONCENTRATION PPM                           10.2                    2.7                    4.3

   HC   MASS GRAMS                                  2.06                    .19                    .16
   CO   MASS GRAMS                                 28.12                    .98                   2.27
   CO2  MASS GRAMS                                1708.9                 1778.3                 1516.2
   NOX  MASS GRAMS                                  1.47                    .66                    .61

   HC   GRAMS/KM (GRAMS/MILE)                   .36 (    .58)          .03 (    .05)          .03 (    .04)
   CO   GRAMS/KM (GRAMS/MILE)                  4.93 (   7.94)          .16 (    .26)          .40 (    .64)
   CO2  GRAMS/KM (GRAMS/MILE)                 299.7 (  482.2)        292.7 (  471.0)        264.5 (  425.6)
   NOX  GRAMS/KM (GRAMS/MILE)                   .26 (    .42)          .11 (    .17)          .11 (    .17)
   FUEL CONSUMPTION BY CB L/100KM(MPG)        13.17 (  17.86)        12.51 (  18.80)        11.32 (  20.78)
   CALCULATED DISTANCE KM (MILES)              5.70 (   3.54)         6.07 (   3.78)         5.73 (   3.56)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)                .10 (    .16)
   CO   GRAMS/KM (GRAMS/MILE)               1.22 (   1.96)
   CO2  GRAMS/KM (GRAMS/MILE)             286.38 ( 460.78)
   NOX  GRAMS/KM (GRAMS/MILE)                .14 (    .22)
   FUEL CONSUMPTION BY CB L/100KM (MPG)    12.32 (  19.10)
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                     TABLE      VEHICLE EMISSION RESULTS
                                          SET                              PROJECT NO. 11-4746-001

VEHICLE NO.  244                            TEST NO.        RUN            TEST WEIGHI   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL              DATF  4/17/79                  ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINF 2.1 L(130 CID) L-4                   TIME 15:40                     GASOLINE EM-274-F
TRANSMISSION A3                             DYNO NO.  3                    ODOMETER    9641
GVW     0 KG(    -0 LBS)                    CVS NO.   2
                                            BAG CAHT NO.  1

BAROMFIER 739.65 MM HG(29.12 IN HG)         RELATIVE HUMIDITY 44 PCT
DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)       ABSOLUTE HUMIDITY 10.0 GM/KG( 69.7 GRAINS/LB)      NOX HUMIDITY C.F.  .9755

BAG RESULTS
   BAG NUMBER                                    1
   BLOWER DIF P MM. H2O(IN. H2O)            774.7 (30.5)
   BLOWER INLET P MM. H2O(IN. H2O)          762.0 (30.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)         44.4 (112.0)
   BLOWER REVOLUTIONS                          112162
   CVS FLOW STD. CU. METRES(SCF)            207.5 (7327.8)

   HC  SAMPLE METER/RANGE/PPM               17.4/ 2/   17
   HC  BCKGRD METER/RANGE/PPM               12.7/ 2/   13
   CO  SAMPLE METER/RANGE/PPM               84.0/13/   84
   CO  BCKGRD METER/RANGE/PPM                1.8/13/    2
   CO2 SAMPLE METER/RANGE/PCT               74.2/ 3/ 1.35
   CO2 BCKGRD METER/RANGE/PCT                3.6/ 3/  .06
   NOX SAMPLE METER/RANGE/PPM                6.1/ 2/    6
   NOX BCKGRD METER/RANGE/PPM                1.1/ 2/    1

   DILUTION FACTOR                               9.85
   HC  CONCENTRATION PPM                           6
   CO  CONCENTRATION PPM                          79
   CO2 CONCENTRATION PCT                        1.30
   NOX CONCENTRATION PPM                         5.1

   HC  MASS GRAMS                                .72
   CO  MASS GRAMS                              19.07
   CO2 MASS GRAMS                             4941.1
   NOX MASS GRAMS                               1.98

   HC  GRAMS/KM (GRAMS/MILE)                  .03 (   .05)
   CO  GRAMS/KM (GRAMS/MILE)                  .89 (  1.43)
   CO2 GRAMS/KM (GRAMS/MILE)                230.5 ( 370.8)
   NOX GRAMS/KM (GRAMS/MILE)                  .09 (   .15)
   FUEL CONSUMPTION BY CB L/100KM(MPG)       9.90 ( 23.76)
   CALCULATED DISTANCE KM (MILES)           21.44 ( 13.33)
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                                 TABLE     VEHICLE EMISSION RESULTS
                                                    FET
                                                                                      PROJECT NO. 11-4746-001
VEHICLE NO.  244                                     TEST NO.       RUN
VEHICLE MODEL    78 VOLVO 244DL                      DATE  4/17/79                  TEST WEIGHT    1591 KG(  3500 LBS)
ENGINE 2.1 L(130 CID) L-4                            TIME 16:13                     ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
TRANSMISSION A3                                      DYNO NO.  3                    GASOLINE EM-274-F
GVW      0 KG(     -0 LBS)                           CVS NO.   2                    ODOMETER     4654
                                                     BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)                  RELATIVE HUMIDITY 42 PCT
DRY BULB TEMP. 27.2 DEG C(81.0 DEG F)                ABSOLUTE HUMIDITY  9.7 GM/KG( 68.0 GRAINS/LB)      NOX HUMIDITY C.F.  .9683

BAG RESULTS
  BAG NUMBER                                                  1
  BLOWER DIF P MM. H2O(IN. H2O)                        774.7 (30.5)
  BLOWER INLET P MM. H2O(IN. H2O)                      762.0 (30.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)                     44.4 (112.0)
  BLOWER REVOLUTIONS                                      61544
  CVS FLOW STD. CU. METRES(SCF)                        113.8 (4017.8)

  HC   SAMPLE METER/RANGE/PPM                          17.5/ 2/   18
  HC   BCKGRD METER/RANGE/PPM                          11.1/ 2/   11
  CO   SAMPLE METER/RANGE/PPM                          48.8/12/  107
  CO   BCKGRD METER/RANGE/PPM                           1.0/12/    2
  CO2  SAMPLE METER/RANGE/PCT                          92.3/ 3/ 1.73
  CO2  BCKGRD METER/RANGE/PCT                           3.5/ 3/  .05
  NOX  SAMPLE METER/RANGE/PPM                           7.5/ 2/    8
  NOX  BCKGRD METER/RANGE/PPM                           1.1/ 2/    1

  DILUTION FACTOR                                           7.71
  HC   CONCENTRATION PPM                                       8
  CO   CONCENTRATION PPM                                     101
  CO2  CONCENTRATION PCT                                    1.68
  NOX  CONCENTRATION PPM                                     6.5

  HC   MASS GRAMS                                            .51
  CO   MASS GRAMS                                          17.36
  CO2  MASS GRAMS                                         3499.4
  NOX  MASS GRAMS                                           1.39

  HC   GRAMS/KM (GRAMS/MILE)                           .02 (    .04)
  CO   GRAMS/KM (GRAMS/MILE)                           .60 (    .96)
  CO2  GRAMS/KM (GRAMS/MILE)                         155.9 ( 250.8)
  NOX  GRAMS/KM (GRAMS/MILE)                           .06 (    .10)
  FUEL CONSUMPTION BY CB L/100KM(MPG)                 9.24  ( 25.460 )
  CALCULATED DISTANCE KM (MILES)                     16.27  ( 10.11  )
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                         TABLE      VEHICLE EMISSION RESULTS
                                              FTP                                    PROJECT NO. 11-4746-001
VEHICLE NO.  244                         TEST NO.       RUN                 TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL           DATE  4/19/79                      ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                TIME 13:00                         GASOLINE EM-274F
TRANSMISSION A3                          DYNO NO.  3                        ODOMETER    9674
GVW     0 KG(    -0 LBS)                 CVS NO.   2
                                         BAG CART NO.  1

BAROMETER 740.41 MM HG(29.15 IN HG)      RELATIVE HUMIDITY 48 PCT
DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)    ABSOLUTE HUMIDITY 10.7 GM/KG( 74.6 GRAINS/LB)     NOX HUMIDITY C.F.  .9982

BAG RESULTS
   BAG NUMBER                                    1                  2                  3
   DESCRIPTION                             COLD TRANSIENT      STABILIZED        HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)           774.7 (30.5)       774.7 (30.5)       774.7 (30.5)
   BLOWER INLET P MM. H2O(IN. H2O)         762.0 (30.0)       762.0 (30.0)       762.0 (30.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)        43.3 (110.0)       43.3 (110.0)       43.3 (110.0)
   BLOWER REVOLUTIONS                         40671              69631              40508
   CVS FLOW STD. CU. METRES(SCF)            75.5 (2665.6)     129.2 (4562.9)      75.2 (2654.4)

   HC  SAMPLE METER/RANGE/PPM              71.1/ 2/   71      19.0/ 2/   19      21.0/ 2/   21
   HC  BCKGRD METER/RANGE/PPM              19.8/ 2/   20      22.6/ 2/   23      18.7/ 2/   19
   CO  SAMPLE METER/RANGE/PPM              86.3/11/  414       9.9/13/   10      56.2/13/   54
   CO  BCKGRD METER/RANGE/PPM               1.6/11/    5       4.7/13/    5       4.1/13/    4
   CO2 SAMPLE METER/RANGE/PCT              70.2/ 3/ 1.27      47.1/ 3/  .81      64.6/ 3/ 1.15
   CO2 BCKGRD METER/RANGE/PCT               4.3/ 3/  .07       4.1/ 3/  .06       4.2/ 3/  .06
   NOX SAMPLE METER/RANGE/PPM              10.2/ 2/   10       3.6/ 2/    4       5.3/ 2/    5
   NOX BCKGRD METER/RANGE/PPM               1.5/ 2/    2       1.3/ 2/    1       1.3/ 2/    1

   DILUTION FACTOR                             10.19              16.46              11.53
   HC  CONCENTRATION PPM                         53                 -2                  4
   CO  CONCENTRATION PPM                        394                  5                 48
   CO2 CONCENTRATION PCT                        1.21               .75               1.10
   NOX CONCENTRATION PPM                        8.8                2.4                4.1

   HC  MASS GRAMS                               2.32              -.17                .17
   CO  MASS GRAMS                              34.58               .76               4.22
   CO2 MASS GRAMS                             1670.5            1780.0             1508.4
   NOX MASS GRAMS                               1.27               .59                .59

   HC  GRAMS/KM (GRAMS/MILE)                 .41 (   .66)      -.03 (  -.04)       .03 (   .05)
   CO  GRAMS/KM (GRAMS/MILE)                6.08 (  9.78)       .12 (   .20)       .74 (  1.19)
   CO2 GRAMS/KM (GRAMS/MILE)               293.5 ( 472.2)     293.2 ( 471.8)     264.1 ( 424.9)
   NOX GRAMS/KM (GRAMS/MILE)                 .22 (   .36)       .10 (   .16)       .10 (   .17)
   FUEL CONSUMPTION BY CB L/100KM(MPG)     12.99 ( 18.11)     12.52 ( 18.79)     11.32 ( 20.77)
   CALCULATED DISTANCE KM (MILES)           5.69 (  3.54)      6.07 (  3.77)      5.71 (  3.55)

COMPOSITE FTP RESULTS
   HC  GRAMS/KM (GRAMS/MILE)              .08 (   .13)
   CO  GRAMS/KM (GRAMS/MILE)             1.53 (  2.47)
   CO2 GRAMS/KM (GRAMS/MILE)           285.22 (458.92)
   NOX GRAMS/KM (GRAMS/MILE)              .13 (   .20)
   FUEL CONSUMPTION BY CB L/100KM (MPG) 12.29 ( 19.15)
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                              TABLE     VEHICLE EMISSION RESULTS
                                              SET                                       PROJECT NO. 11-4746-001

VEHICLE NO.  244                                 TEST NO.        RUN                     TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                   DATE  4/19/79                           ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                        TIME 15:25                              GASOLINE EM-274-F
TRANSMISSION A3                                  DYNO NO.  3                             ODOMETER    9687
GVW     0 KG(    -0 LBS)                         CVS NO.   2
                                                 BAG CART NO.  1

BAROMETER 736.09 MM HG(28.98 IN HG)              RELATIVE HUMIDITY 63 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)            ABSOLUTE HUMIDITY 13.0 GM/KG( 90.9 GRAINS/LB)      NOX HUMIDITY C.F. 1.0805

BAG RESULTS
   BAG NUMBER                                           1
   BLOWER DIF P MM. H2O(IN. H2O)                 774.7 (30.5)
   BLOWER INLET P MM. H2O(IN. H2O)               762.0 (30.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)              43.3 (110.0)
   BLOWER REVOLUTIONS                              112114
   CVS FLOW STD. CU. METRES(SCF)                 206.7 (7299.3)

   HC  SAMPLE METER/RANGE/PPM                    19.1/ 2/   19
   HC  BCKGRD METER/RANGE/PPM                    15.1/ 2/   15
   CO  SAMPLE METER/RANGE/PPM                    75.6/13/   74
   CO  BCKGRD METER/RANGE/PPM                     1.9/13/    2
   CO2 SAMPLE METER/RANGE/PCT                    74.9/ 3/ 1.36
   CO2 BCKGRD METER/RANGE/PCT                     4.3/ 3/  .07
   NOX SAMPLE METER/RANGE/PPM                     6.7/ 2/    7
   NOX BCKGRD METER/RANGE/PPM                     2.5/ 2/    3

   DILUTION FACTOR                                   9.76
   HC  CONCENTRATION PPM                                6
   CO  CONCENTRATION PPM                               69
   CO2 CONCENTRATION PCT                             1.31
   NOX CONCENTRATION PPM                              4.5

   HC  MASS GRAMS                                     .66
   CO  MASS GRAMS                                   16.68
   CO2 MASS GRAMS                                  4939.5
   NOX MASS GRAMS                                    1.90

   HC  GRAMS/KM (GRAMS/MILE)                       .03 (   .05)
   CO  GRAMS/KM (GRAMS/MILE)                       .77 (  1.24)
   CO2 GRAMS/KM (GRAMS/MILE)                     228.3 ( 367.4)
   NOX GRAMS/KM (GRAMS/MILE)                       .09 (   .14)
   FUEL CONSUMPTION BY CB L/100KM(MPG)            9.80 ( 24.00)
   CALCULATED DISTANCE KM (MILES)                21.63 ( 13.45)
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                                   TABLE     VEHICLE EMISSION RESULTS
                                                    FET                                PROJECT NO. 11-4746-001

VEHICLE NO.  244                                TEST NO.        RUN                TEST WEIGHT    1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                  DATE  4/19/79                      ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                       TIME                               GASOLINE EM-274-F
TRANSMISSION A3                                 DYNO NO.  3                        ODOMETER     9691
GVW      0 KG(    -0 LBS)                       CVS NO.   2
                                                BAG CART NO.  1

BAROMETER 736.09 MM HG(28.98 IN HG)             RELATIVE HUMIDITY 40 PCT
DRY BULB TEMP. 27.8 DEG C(82.0 DEG F)           ABSOLUTE HUMIDITY  9.5 GM/KG( 66.8 GRAINS/LB)      NOX HUMIDITY C.F.  .9627

BAG RESULTS
   BAG NUMBER                                         1
   BLOWER DIF P MM. H2O(IN. H2O)               800.1 (31.5)
   BLOWER INLET P MM. H2O(IN. H2O)             762.0 (30.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)            43.3 (110.0)
   BLOWER REVOLUTIONS                              61475
   CVS FLOW STD. CU. METRES(SCF)               113.2 (3999.0)

   HC   SAMPLE METER/RANGE/PPM                 18.7/ 2/   19
   HC   BCKGRD METER/RANGE/PPM                 13.5/ 2/   13
   CO   SAMPLE METER/RANGE/PPM                 91.5/13/   93
   CO   BCKGRD METER/RANGE/PPM                  2.0/13/    2
   CO2  SAMPLE METER/RANGE/PCT                 91.6/ 3/ 1.71
   CO2  BCKGRD METER/RANGE/PCT                  4.1/ 3/  .06
   NOX  SAMPLE METER/RANGE/PPM                  8.9/ 2/    9
   NOX  BCKGRD METER/RANGE/PPM                  2.6/ 2/    3

   DILUTION FACTOR                                 7.78
   HC   CONCENTRATION PPM                             7
   CO   CONCENTRATION PPM                            87
   CO2  CONCENTRATION PCT                          1.66
   NOX  CONCENTRATION PPM                           6.6

   HC   MASS GRAMS                                  .45
   CO   MASS GRAMS                                11.41
   CO2  MASS GRAMS                               3435.6
   NOX  MASS GRAMS                                 1.38

   HC   GRAMS/KM (GRAMS/MILE)                   .03 (    .04)
   CO   GRAMS/KM (GRAMS/MILE)                   .70 (   1.13)
   CO2  GRAMS/KM (GRAMS/MILE)                 211.2 (  339.9)
   NOX  GRAMS/KM (GRAMS/MILE)                   .09 (    .14)
   FUEL CONSUMPTION BY CB L/100KM(MPG)         9.07 (  25.95)
   CALCULATED DISTANCE KM (MILES)             16.27 (  10.11)
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                          TABLE      VEHICLE EMISSION RESULTS
                                              FTP                                        PROJECT NO. 11-4746-001

VEHICLE NO.  244                                TEST NO.    3  RUN 1                  TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                  DATE  5/11/79                         ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                       TIME 13:09                            GASOLINE EM-274-F
TRANSMISSION A3                                 DYNO NO.  3                           ODOMETER   14998
GVW  1591 KG(  3500 LBS)                        CVS NO.   2
                                                BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)             RELATIVE HUMIDITY 62 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)           ABSOLUTE HUMIDITY 11.9 GM/KG( 83.3 GRAINS/LB)      NOX HUMIDITY C.F. 1.0404

BAG RESULTS
   BAG NUMBER                                         1                    2                    3
   DESCRIPTION                                 COLD TRANSIENT         STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                787.4 (31.0)         787.4 (31.0)         800.1 (31.5)
   BLOWER INLET P MM. H2O(IN. H2O)              774.7 (30.5)         774.7 (30.5)         774.7 (30.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)             43.3 (110.0)         43.3 (110.0)         43.3 (110.0)
   BLOWER REVOLUTIONS                              40477                69682                40471
   CVS FLOW STD. CU. METRES(SCF)                74.8 (2642.7)       128.8 (4549.1)        74.8 (2640.6)

   HC   SAMPLE METER/RANGE/PPM                 54.8/ 2/   55        12.9/ 2/   13        16.3/ 2/   16
   HC   BCKGRD METER/RANGE/PPM                  9.4/ 2/    9         8.2/ 2/    8         8.9/ 2/    9
   CO   SAMPLE METER/RANGE/PPM                 76.0/11/  338        74.6/13/   73        57.1/13/   55
   CO   BCKGRD METER/RANGE/PPM                  1.0/11/    3         1.8/13/    2          .5/13/    0
   CO2  SAMPLE METER/RANGE/PCT                 68.6/ 3/ 1.24        45.0/ 3/  .77        63.8/ 3/ 1.14
   CO2  BCKGRD METER/RANGE/PCT                  2.7/ 3/  .04         2.7/ 3/  .04         2.8/ 3/  .04
   NOX  SAMPLE METER/RANGE/PPM                 11.8/ 2/   12         1.3/ 2/    1         5.2/ 2/    5
   NOX  BCKGRD METER/RANGE/PPM                  1.4/ 2/    1         1.0/ 2/    1         1.1/ 2/    1

   DILUTION FACTOR                                 10.52                17.18                11.70
   HC   CONCENTRATION PPM                            46                   5                    8
   CO   CONCENTRATION PPM                           320                  69                   52
   CO2  CONCENTRATION PCT                          1.20                 .73                 1.10
   NOX  CONCENTRATION PPM                          10.5                  .4                  4.2

   HC   MASS GRAMS                                 2.00                 .38                  .35
   CO   MASS GRAMS                                27.91               10.37                 4.53
   CO2  MASS GRAMS                               1642.1              1728.2               1505.6
   NOX  MASS GRAMS                                 1.57                 .09                  .62

   HC   GRAMS/KM (GRAMS/MILE)                   .35 (   .56)        .06 (   .10)        .06 (   .10)
   CO   GRAMS/KM (GRAMS/MILE)                  4.85 (  7.80)       1.67 (  2.69)        .78 (  1.26)
   CO2  GRAMS/KM (GRAMS/MILE)                 285.1 ( 458.7)      279.0 ( 448.9)      260.4 ( 419.0)
   NOX  GRAMS/KM (GRAMS/MILE)                   .27 (   .44)        .01 (   .02)        .11 (   .17)
   FUEL CONSUMPTION BY CB L/100KM(MPG)        12.54 ( 18.76)      12.03 ( 19.56)      11.18 ( 21.05)
   CALCULATED DISTANCE KM (MILES)              5.76 (  3.58)       6.19 (  3.85)       5.78 (  3.59)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)           .12 (   .19)
   CO   GRAMS/KM (GRAMS/MILE)          2.09 (  3.36)
   CO2  GRAMS/KM (GRAMS/MILE)        275.15 (442.71)
   NOX  GRAMS/KM (GRAMS/MILE)           .09 (   .15)
   FUEL CONSUMPTION BY CB L/100KM (MPG)   11.90 ( 19.77)
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                                   TABLE      VEHICLE EMISSION RESULTS
                                                        SET
                                                                                    PROJECT NO. 11-4746-001

VEHICLE NO.  244                                  TEST NO.    3  RUN 1          TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL    78 VOLVO 244DL                   DATE  5/11/79                 ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                         TIME 15:05                    GASOLINE EM-274
TRANSMISSION A3                                   DYNO NO.  3                   ODOMETER   15012
GVW     0 KG(    -0 LBS)                          CVS NO.  2
                                                  BAG CART NO.  1

BAROMETER 740.66 MM HG(29.16 IN HG)               RELATIVE HUMIDITY 42 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)             ABSOLUTE HUMIDITY  8.2 GM/KG( 57.1 GRAINS/LB)      NOX HUMIDITY C.F.  .9222

BAG RESULTS
  BAG NUMBER                                             1
  BLOWER DIF P MM. H2O(IN. H2O)                 787.4 (31.0)
  BLOWER INLET P MM. H2O(IN. H2O)               774.7 (30.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)              43.3 (110.0)
  BLOWER REVOLUTIONS                              112057
  CVS FLOW STD. CU. METRES(SCF)                 207.6 (7332.3)

  HC  SAMPLE METER/RANGE/PPM                    18.8/ 2/   19
  HC  BCKGRD METER/RANGE/PPM                    11.0/ 2/   11
  CO  SAMPLE METER/RANGE/PPM                    59.2/12/  132
  CO  BCKGRD METER/RANGE/PPM                     .6/12/    1
  CO2 SAMPLE METER/RANGE/PCT                    74.8/ 3/ 1.36
  CO2 BCKGRD METER/RANGE/PCT                     3.3/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                     5.3/ 2/    5
  NOX BCKGRD METER/RANGE/PPM                     2.3/ 2/    2

  DILUTION FACTOR                                   9.73
  HC  CONCENTRATION PPM                                9
  CO  CONCENTRATION PPM                              126
  CO2 CONCENTRATION PCT                             1.32
  NOX CONCENTRATION PPM                              3.2

  HC  MASS GRAMS                                    1.07
  CO  MASS GRAMS                                   30.43
  CO2 MASS GRAMS                                  5007.0
  NOX MASS GRAMS                                    1.19

  HC  GRAMS/KM (GRAMS/MILE)                      .05 (    .08)
  CO  GRAMS/KM (GRAMS/MILE)                     1.40 (   2.25)
  CO2 GRAMS/KM (GRAMS/MILE)                    229.8 (  369.7)
  NOX GRAMS/KM (GRAMS/MILE)                      .05 (    .09)
  FUEL CONSUMPTION BY CB L/100KM(MPG)           9.91 (  23.74)
  CALCULATED DISTANCE KM (MILES)               21.79 (  13.54)
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                    TABLE      VEHICLE EMISSION RESULTS
                                      FET                          PROJECT NO. 11-4746-001

VEHICLE NO.  244                      TEST NO.    3  RUN 1         TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL        DATE  5/11/79                ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4             TIME 15:40                   GASOLINE EM-274
TRANSMISSION A3                       DYNO NO.  3                  ODOMETER   15025
GVW     0 KG(    -0 LBS)              CVS NO.   2
                                      BAG CART NO.  1

BAROMETER 740.66 MM HG(29.16 IN HG)   RELATIVE HUMIDITY 51 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F) ABSOLUTE HUMIDITY  9.7 GM/KG( 68.1 GRAINS/LB)     NOX HUMIDITY C.F.  .9687

BAG RESULTS
  BAG NUMBER                                1
  BLOWER DIF P MM. H2O(IN. H2O)      787.4 (31.0)
  BLOWER INLET P MM. H2O(IN. H2O)    774.7 (30.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)   43.3 (110.0)
  BLOWER REVOLUTIONS                     61450
  CVS FLOW STD. CU. METRES(SCF)      113.8 (4021.1)

  HC  SAMPLE METER/RANGE/PPM         19.9/ 2/   20
  HC  BCKGRD METER/RANGE/PPM          9.0/ 2/    9
  CO  SAMPLE METER/RANGE/PPM         70.5/12/  160
  CO  BCKGRD METER/RANGE/PPM           .6/12/    1
  CO2 SAMPLE METER/RANGE/PCT         94.3/ 3/ 1.77
  CO2 BCKGRD METER/RANGE/PCT          2.4/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM          8.1/ 2/    8
  NOX BCKGRD METER/RANGE/PPM          2.0/ 2/    2

  DILUTION FACTOR                          7.50
  HC  CONCENTRATION PPM                      12
  CO  CONCENTRATION PPM                     151
  CO2 CONCENTRATION PCT                    1.74
  NOX CONCENTRATION PPM                     6.4

  HC  MASS GRAMS                            .79
  CO  MASS GRAMS                          19.97
  CO2 MASS GRAMS                         3621.0
  NOX MASS GRAMS                           1.34

  HC  GRAMS/KM (GRAMS/MILE)           .05 (   .08)
  CO  GRAMS/KM (GRAMS/MILE)          1.20 (  1.93)
  CO2 GRAMS/KM (GRAMS/MILE)         217.5 ( 349.9)
  NOX GRAMS/KM (GRAMS/MILE)           .08 (   .13)
  FUEL CONSUMPTION BY CB L/100KM(MPG) 9.37 ( 25.11)
  CALCULATED DISTANCE KM (MILES)     16.65 ( 10.35)
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                                TABLE       VEHICLE EMISSION RESULTS
                                                      FTP                                     PROJECT NO. 11-4746-001

VEHICLE NO.  244                                      TEST NO.    3  RUN 2                   TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                        DATE  5/21/79                          ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                             TIME 09:33                             GASOLINE EM-274-F
TRANSMISSION A3                                       DYNO NO.  3                            ODOMETER   15048
GVW     0 KG(    -0 LBS)                              CVS NO.   2
                                                      BAG CART NO.  1

BAROMETER 738.12 MM HG(29.06 IN HG)                   RELATIVE HUMIDITY 69 PCT
DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)                 ABSOLUTE HUMIDITY 11.9 GM/KG( 83.4 GRAINS/LB)      NOX HUMIDITY C.F. 1.0410

BAG RESULTS
   BAG NUMBER                                           1                   2                    3
   DESCRIPTION                                   COLD TRANSIENT         STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                  800.1 (31.5)        800.1 (31.5)         800.1 (31.5)
   BLOWER INLET P MM. H2O(IN. H2O)                787.4 (31.0)        787.4 (31.0)         787.4 (31.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)               43.3 (110.0)        42.2 (108.0)         43.3 (110.0)
   BLOWER REVOLUTIONS                                40561               69753                40518
   CVS FLOW STD. CU. METRES(SCF)                   74.7 (2639.3)      128.8 (4547.6)        74.6 (2636.3)

   HC   SAMPLE METER/RANGE/PPM                   62.8/ 2/    63      10.9/ 2/    11       19.5/ 2/    19
   HC   BCKGRD METER/RANGE/PPM                   11.9/ 2/    12       9.4/ 2/     9        9.1/ 2/     9
   CO   SAMPLE METER/RANGE/PPM                   76.7/11/   343       4.8/13/     5       60.6/13/    58
   CO   BCKGRD METER/RANGE/PPM                    1.0/11/     3       2.1/13/     2        1.6/13/     2
   CO2  SAMPLE METER/RANGE/PCT                   70.2/ 3/ 1.27       48.4/ 3/  .84       63.4/ 3/ 1.13
   CO2  BCKGRD METER/RANGE/PCT                    2.9/ 3/  .04        3.0/ 3/  .05        2.9/ 3/  .04
   NOX  SAMPLE METER/RANGE/PPM                   21.3/ 2/    21       8.6/ 2/     9       18.5/ 2/    18
   NOX  BCKGRD METER/RANGE/PPM                    2.9/ 2/     3       1.4/ 2/     1        1.0/ 2/     1

   DILUTION FACTOR                                  10.25               15.99                11.77
   HC   CONCENTRATION PPM                             52                   2                    11
   CO   CONCENTRATION PPM                            324                   3                    54
   CO2  CONCENTRATION PCT                           1.23                 .79                  1.09
   NOX  CONCENTRATION PPM                           18.7                 7.3                  17.6

   HC   MASS GRAMS                                  2.24                 .16                   .48
   CO   MASS GRAMS                                 28.19                 .39                  4.73
   CO2  MASS GRAMS                                1680.8              1870.6                1490.3
   NOX  MASS GRAMS                                  2.78                1.87                  2.61

   HC   GRAMS/KM (GRAMS/MILE)                    .39 (   .63)        .02 (   .04)         .08 (   .13)
   CO   GRAMS/KM (GRAMS/MILE)                   4.90 (  7.89)        .06 (   .10)         .82 (  1.32)
   CO2  GRAMS/KM (GRAMS/MILE)                  292.4 ( 470.4)      300.8 ( 484.0)       258.8 ( 416.4)
   NOX  GRAMS/KM (GRAMS/MILE)                    .48 (   .78)        .30 (   .48)         .45 (   .73)
   FUEL CONSUMPTION BY CB L/100KM(MPG)         12.86 ( 18.29)      12.85 ( 18.31)       11.11 ( 21.17)
   CALCULATED DISTANCE KM (MILES)               5.75 (  3.57)       6.22 (  3.87)        5.76 (  3.58)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)               .12 (   .19)
   CO   GRAMS/KM (GRAMS/MILE)              1.27 (  2.04)
   CO2  GRAMS/KM (GRAMS/MILE)            287.55 (462.67)
   NOX  GRAMS/KM (GRAMS/MILE)               .38 (   .61)
   FUEL CONSUMPTION BY CB L/100KM (MPG)   12.37 ( 19.01)
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                                   TABLE      VEHICLE EMISSION RESULTS
                                                      SET                                   PROJECT NO. 11-4746-001

VEHICLE NO.  244                                TEST NO.     3  RUN 2               TEST WEIGHT    1591 KG(  3500 LBS)
VEHICLE MODEL    78 VOLVO 244DL                 DATE  5/21/79                       ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                       TIME 11:59                          GASOLINE EM-274-F
TRANSMISSION A3                                 DYNO NO.  3                         ODOMETER    15062
GVW       0 KG(     -0 LBS)                     CVS NO.   2
                                                BAG CART NO.  1

BAROMETER 738.12 MM HG(29.06 IN HG)             RELATIVE HUMIDITY 59 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)           ABSOLUTE HUMIDITY 11.2 GM/KG( 78.3 GRAINS/LB)       NOX HUMIDITY C.F. 1.0157

BAG RESULTS
  BAG NUMBER                                         1
  BLOWER DIF P MM. H2O(IN. H2O)                800.1 (31.5)
  BLOWER INLET P MM. H2O(IN. H2O)              787.4 (31.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)             43.3 (110.0)
  BLOWER REVOLUTIONS                             112149
  CVS FLOW STD. CU. METRES(SCF)                206.6 (7297.0)

  HC   SAMPLE METER/RANGE/PPM                   9.7/ 2/    10
  HC   BCKGRD METER/RANGE/PPM                   8.1/ 2/     8
  CO   SAMPLE METER/RANGE/PPM                  11.7/13/    11
  CO   BCKGRD METER/RANGE/PPM                   1.1/13/     1
  CO2  SAMPLE METER/RANGE/PCT                  76.6/ 3/ 1.40
  CO2  BCKGRD METER/RANGE/PCT                   3.2/ 3/   .05
  NOX  SAMPLE METER/RANGE/PPM                  10.9/ 2/    11
  NOX  BCKGRD METER/RANGE/PPM                   1.0/ 2/     1

  DILUTION FACTOR                                  9.56
  HC   CONCENTRATION PPM                              2
  CO   CONCENTRATION PPM                             10
  CO2  CONCENTRATION PCT                           1.36
  NOX  CONCENTRATION PPM                           10.0

  HC   MASS GRAMS                                   .29
  CO   MASS GRAMS                                  2.36
  CO2  MASS GRAMS                                5128.7
  NOX  MASS GRAMS                                  4.02

  HC   GRAMS/KM (GRAMS/MILE)                     .01 (    .02)
  CO   GRAMS/KM (GRAMS/MILE)                     .11 (    .18)
  CO2  GRAMS/KM (GRAMS/MILE)                   236.8 (  381.0)
  NOX  GRAMS/KM (GRAMS/MILE)                     .19 (    .30)
  FUEL CONSUMPTION BY CB L/100KM(MPG)          10.12 (  23.26)
  CALCULATED DISTANCE KM (MILES)               21.66 (  13.46)
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                           TABLE      VEHICLE EMISSION RESULTS
                                                  FET                                         PROJECT NO. 11-4746-001

VEHICLE NO.  244                                  TEST NO.    3  RUN 2                 TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                    DATE  5/21/79                        ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                         TIME 12:31                           GASOLINE EM-274-F
TRANSMISSION A3                                   DYNO NO.  3                          ODOMETER    15076
GVW      0 KG(    -0 LBS)                         CVS NO.   2
                                                  BAG CART NO.  1

BAROMETER 738.12 MM.HG(29.06 IN HG)               RELATIVE HUMIDITY 55 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)             ABSOLUTE HUMIDITY 10.5 GM/KG( 73.3 GRAINS/LB)      NOX HUMIDITY C.F.  .9921

BAG RESULTS
  BAG NUMBER                                             1
  BLOWER DIF P MM. H2O(IN. H2O)                  800.1 (31.5)
  BLOWER INLET P MM. H2O(IN. H2O)                787.4 (31.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)               43.3 (110.0)
  BLOWER REVOLUTIONS                                 61471
  CVS FLOW STD. CU. METRES(SCF)                  113.2 (3999.7)

  HC  SAMPLE METER/RANGE/PPM                     11.1/ 2/    11
  HC  BCKGRD METER/RANGE/PPM                      7.9/ 2/     8
  CO  SAMPLE METER/RANGE/PPM                     31.7/13/    30
  CO  BCKGRD METER/RANGE/PPM                      1.2/13/     1
  CO2 SAMPLE METER/RANGE/PCT                     93.6/ 3/ 1.75
  CO2 BCKGRD METER/RANGE/PCT                      3.1/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                     20.0/ 3/    60
  NOX BCKGRD METER/RANGE/PPM                      1.4/ 2/     1

  DILUTION FACTOR                                     7.62
  HC  CONCENTRATION PPM                                  4
  CO  CONCENTRATION PPM                                 27
  CO2 CONCENTRATION PCT                               1.71
  NOX CONCENTRATION PPM                               58.8

  HC  MASS GRAMS                                       .28
  CO  MASS GRAMS                                      3.62
  CO2 MASS GRAMS                                    3551.6
  NOX MASS GRAMS                                     12.63

  HC  GRAMS/KM (GRAMS/MILE)                        .02 (   .03)
  CO  GRAMS/KM (GRAMS/MILE)                        .22 (   .36)
  CO2 GRAMS/KM (GRAMS/MILE)                      217.9 ( 350.6)
  NOX GRAMS/KM (GRAMS/MILE)                        .78 (  1.25)
  FUEL CONSUMPTION BY CB L/100KM(MPG)             9.32 ( 25.25)
  CALCULATED DISTANCE KM (MILES)                 16.30 ( 10.13)
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                               TABLE      VEHICLE EMISSION RESULTS
                                                    FTP                                       PROJECT NO. 11-4746-001

VEHICLE NO.  244                                   TEST NO.     4  RUN 1                  TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                     DATE  6/12/79                          ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 2.1 L(130 CID) L-4                          TIME 12:57                             GASOLINE EM
TRANSMISSION A3                                    DYNO NO.  3                            ODOMETER   19935
GVW      0 KG(     -0 LBS)                         CVS NO.   2
                                                   BAG CART NO.  1

BAROMETER 745.74 MM HG(29.36 IN HG)                RELATIVE HUMIDITY 35 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)              ABSOLUTE HUMIDITY  6.8 GM/KG( 47.5 GRAINS/LB)      NOX HUMIDITY C.F.  .8857

BAG RESULTS
   BAG NUMBER                                            1                  2                  3
   DESCRIPTION                                   COLD TRANSIENT        STABILIZED        HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                 838.2 (33.0)       838.2 (33.0)       838.2 (33.0)
   BLOWER INLET P MM. H2O(IN. H2O)               812.8 (32.0)       812.8 (32.0)       812.8 (32.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)              43.3 (110.0)       41.7 (107.0)       43.3 (110.0)
   BLOWER REVOLUTIONS                                40421              69504              40312
   CVS FLOW STD. CU. METRES(SCF)                  75.0 (2649.2)     129.3 (4568.5)      74.8 (2641.9)

   HC   SAMPLE METER/RANGE/PPM                   79.9/ 2/    80     12.4/ 2/    12     20.7/ 2/    21
   HC   BCKGRD METER/RANGE/PPM                   11.8/ 2/    12     10.1/ 2/    10      9.4/ 2/     9
   CO   SAMPLE METER/RANGE/PPM                   88.9/11/   436     34.5/13/    33     53.2/12/   118
   CO   BCKGRD METER/RANGE/PPM                    2.4/11/     7      5.7/13/     6      1.7/12/     3
   CO2  SAMPLE METER/RANGE/PCT                   71.3/ 3/  1.29     48.9/ 3/   .85     64.1/ 3/  1.14
   CO2  BCKGRD METER/RANGE/PCT                    3.5/ 3/   .05      3.7/ 3/   .06      3.5/ 3/   .05
   NOX  SAMPLE METER/RANGE/PPM                   32.4/ 2/    32      5.2/ 2/     5     18.2/ 2/    18
   NOX  BCKGRD METER/RANGE/PPM                    1.2/ 2/     1      1.1/ 2/     1      1.0/ 2/     1

   DILUTION FACTOR                                    9.99              15.76              11.57
   HC   CONCENTRATION PPM                             69                  3                 12
   CO   CONCENTRATION PPM                            413                 27                111
   CO2  CONCENTRATION PCT                            1.24               .79               1.10
   NOX  CONCENTRATION PPM                            31.3               4.2               17.3

   HC   MASS GRAMS                                   3.00               .22                .52
   CO   MASS GRAMS                                  36.11              4.01               9.69
   CO2  MASS GRAMS                                 1706.6            1878.0             1501.2
   NOX  MASS GRAMS                                   3.98               .91               2.19

   HC   GRAMS/KM (GRAMS/MILE)                     .52 (   .84)       .04 (   .06)       .09 (   .14)
   CO   GRAMS/KM (GRAMS/MILE)                    6.29 ( 10.12)       .65 (  1.04)      1.61 (  2.59)
   CO2  GRAMS/KM (GRAMS/MILE)                   297.1 ( 478.1)     303.2 ( 487.8)     249.8 ( 401.9)
   NOX  GRAMS/KM (GRAMS/MILE)                     .69 (  1.12)       .15 (   .24)       .36 (   .59)
   FUEL CONSUMPTION BY CB L/100KM(MPG)          13.17 ( 17.86)     12.99 ( 18.11)     10.78 ( 21.82)
   CALCULATED DISTANCE KM (MILES)                5.74 (  3.57)      6.19 (  3.85)      6.01 (  3.74)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)              .15 (   .24)
   CO   GRAMS/KM (GRAMS/MILE)             2.08 (  3.35)
   CO2  GRAMS/KM (GRAMS/MILE)           286.94 (461.68)
   NOX  GRAMS/KM (GRAMS/MILE)              .32 (   .52)
   FUEL CONSUMPTION BY CB L/100KM (MPG)  12.41 ( 18.96)
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                    TABLE      VEHICLE EMISSION RESULTS
                                       SET FET                                        PROJECT NO. 11-4746-001

VEHICLE NO.  244                              TEST NO.    4  RUN 1              TEST WEIGHT    1591 KG(  3500 LBS)
VEHICLE MODEL   78 11-4746-001                DATE  6/12/79                     ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 2.1 L(130 CID) L-4                     TIME 15:00                        GASOLINE
TRANSMISSION A3                               DYNO NO.  3                       ODOMETER   19949
GVW     0 KG(    -0 LBS)                      CVS NO.   2
                                              BAG CART NO.  1

BAROMETER 745.24 MM HG(29.34 IN HG)           RELATIVE HUMIDITY 38 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)         ABSOLUTE HUMIDITY  7.0 GM/KG( 49.3 GRAINS/LB)      NOX HUMIDITY C.F.  .8921

BAG RESULTS
   BAG NUMBER                                       1                  2
   BLOWER DIF P MM. H2O(IN. H2O)              838.2 (33.0)       838.2 (33.0)
   BLOWER INLET P MM. H2O(IN. H2O)            812.8 (32.0)       812.8 (32.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)           43.3 (110.0)       43.9 (111.0)
   BLOWER REVOLUTIONS                            111559             61389
   CVS FLOW STD. CU. METRES(SCF)              206.8 (7304.5)     113.7 (4016.7)

   HC  SAMPLE METER/RANGE/PPM                 11.8/ 2/   12      12.8/ 2/   13
   HC  BCKGRD METER/RANGE/PPM                  9.4/ 2/    9       8.2/ 2/    8
   CO  SAMPLE METER/RANGE/PPM                 47.2/13/   45      73.1/13/   72
   CO  BCKGRD METER/RANGE/PPM                  3.1/13/    3       2.7/13/    3
   CO2 SAMPLE METER/RANGE/PCT                 75.7/ 3/ 1.38      92.2/ 3/ 1.72
   CO2 BCKGRD METER/RANGE/PCT                  3.2/ 3/  .05       3.1/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                 16.7/ 2/   17      19.2/ 2/   19
   NOX BCKGRD METER/RANGE/PPM                  2.0/ 2/    2       1.6/ 2/    2

   DILUTION FACTOR                                9.67               7.73
   HC  CONCENTRATION PPM                           3                  6
   CO  CONCENTRATION PPM                          40                 66
   CO2 CONCENTRATION PCT                         1.34               1.68
   NOX CONCENTRATION PPM                         14.9               17.8

   HC  MASS GRAMS                                 .40                .37
   CO  MASS GRAMS                                9.74               8.76
   CO2 MASS GRAMS                              5063.5             3505.3
   NOX MASS GRAMS                                5.26               3.46

   HC  GRAMS/KM (GRAMS/MILE)                   .02 (   .03)       .02 (   .04)
   CO  GRAMS/KM (GRAMS/MILE)                   .45 (   .72)       .54 (   .86)
   CO2 GRAMS/KM (GRAMS/MILE)                 232.9 ( 374.7)     214.2 ( 344.7)
   NOX GRAMS/KM (GRAMS/MILE)                   .24 (   .39)       .21 (   .34)
   FUEL CONSUMPTION BY CB L/100KM(MPG)        9.97 ( 23.59)      9.18 ( 25.62)
   CALCULATED DISTANCE KM (MILES)            21.74 ( 13.51)     16.36 ( 10.17)

COMPOSITE FTP RESULTS
   HC  GRAMS/KM (GRAMS/MILE)            .02 (   .03)
   CO  GRAMS/KM (GRAMS/MILE)            .49 (   .78)
   CO2 GRAMS/KM (GRAMS/MILE)         224.85 (361.78)
   NOX GRAMS/KM (GRAMS/MILE)            .23 (   .37)
   FUEL CONSUMPTION BY CB L/100KM (MPG)   9.63 ( 24.42)
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                    TABLE      VEHICLE EMISSION RESULTS
                                         FTP                                   PROJECT NO. 11-4746-001

VEHICLE NO.  244                             TEST NO.    4   RUN 2             TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL               DATE  6/13/79                     ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                    TIME 10:22                        GASOLINE EM-274-F
TRANSMISSION                                 DYNO NO.  3                       ODOMETER    19973
GVW      0 KG(    -0 LBS)                    CVS NO.   2
                                             BAG CART NO.  1

BAROMETER 748.54 MM HG(29.47 IN HG)          RELATIVE HUMIDITY 38 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)        ABSOLUTE HUMIDITY  7.4 GM/KG( 51.7 GRAINS/LB)      NOX HUMIDITY C.F.  .9012

BAG RESULTS
  BAG NUMBER                                       1                   2                   3
  DESCRIPTION                               COLD TRANSIENT         STABILIZED         HOT TRANSIENT
  BLOWER DIF P MM. H2O(IN. H2O)              838.2 (33.0)        838.2 (33.0)        825.5 (32.5)
  BLOWER INLET P MM. H2O(IN. H2O)            812.8 (32.0)        812.8 (32.0)        800.1 (31.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)          43.3 (110.0)        41.1 (106.0)        43.3 (110.0)
  BLOWER REVOLUTIONS                            40468               69622               40416
  CVS FLOW STD. CU. METRES(SCF)              75.4 (2663.8)      130.3 (4600.7)       75.4 (2664.7)

  HC   SAMPLE METER/RANGE/PPM               81.0/ 2/   81       10.8/ 2/   11       18.8/ 2/   19
  HC   BCKGRD METER/RANGE/PPM               11.6/ 2/   12        9.8/ 2/   10        8.5/ 2/    9
  CO   SAMPLE METER/RANGE/PPM               87.2/11/  422       27.1/13/   26       95.3/13/   97
  CO   BCKGRD METER/RANGE/PPM                1.1/11/    3        3.0/13/    3        2.3/13/    2
  CO2  SAMPLE METER/RANGE/PCT               72.5/ 3/ 1.32       47.7/ 3/  .82       65.6/ 3/ 1.18
  CO2  BCKGRD METER/RANGE/PCT                3.2/ 3/  .05        3.7/ 3/  .06        3.5/ 3/  .05
  NOX  SAMPLE METER/RANGE/PPM               28.5/ 2/   28        5.0/ 2/    5       21.0/ 2/   21
  NOX  BCKGRD METER/RANGE/PPM                1.2/ 2/    1        1.3/ 2/    1        1.5/ 2/    2

  DILUTION FACTOR                                9.82               16.21               11.30
  HC   CONCENTRATION PPM                         71                   2                  11
  CO   CONCENTRATION PPM                        403                  22                  92
  CO2  CONCENTRATION PCT                        1.27                .77                 1.13
  NOX  CONCENTRATION PPM                        27.4                3.8                 19.6

  HC   MASS GRAMS                               3.07                .12                 .48
  CO   MASS GRAMS                              35.37               3.37                8.04
  CO2  MASS GRAMS                             1755.7              1836.1              1556.0
  NOX  MASS GRAMS                               3.57                .85                2.55

  HC   GRAMS/KM (GRAMS/MILE)                 .53 (   .85)        .02 (   .03)        .08 (   .13)
  CO   GRAMS/KM (GRAMS/MILE)                6.10 (  9.82)        .54 (   .87)       1.39 (  2.23)
  CO2  GRAMS/KM (GRAMS/MILE)               303.0 ( 487.5)      293.3 ( 471.9)      268.6 ( 432.2)
  NOX  GRAMS/KM (GRAMS/MILE)                 .62 (   .99)        .14 (   .22)        .44 (   .71)
  FUEL CONSUMPTION BY CB L/100KM(MPG)      13.41 ( 17.54)      12.56 ( 18.73)      11.57 ( 20.33)
  CALCULATED DISTANCE KM (MILES)            5.79 (  3.60)       6.26 (  3.89)       5.79 (  3.60)

COMPOSITE FTP RESULTS
  HC   GRAMS/KM (GRAMS/MILE)           .14 (   .23)
  CO   GRAMS/KM (GRAMS/MILE)          1.92 (  3.09)
  CO2  GRAMS/KM (GRAMS/MILE)        288.53 (464.25)
  NOX  GRAMS/KM (GRAMS/MILE)           .32 (   .51)
  FUEL CONSUMPTION BY CB L/100KM (MPG)  12.46 ( 18.87)
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                                   TABLE       VEHICLE EMISSION RESULTS
                                                     SET FET                              PROJECT NO. 11-4746-001

VEHICLE NO.  244                                  TEST NO.    4   RUN 2             TEST WEIGHT    1591 KG(  3500 LBS)
VEHICLE MODEL    78 VOLVO 244DL                   DATE  6/13/79                     ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                         TIME 12:53                        GASOLINE EM-274-F
TRANSMISSION A3                                   DYNO NO.  3                       ODOMETER    19988
GVW      0 KG(    -0 LBS)                         CVS NO.   2
                                                  BAG CART NO.  1

BAROMETER 744.98 MM HG(29.33 IN HG)               RELATIVE HUMIDITY 42 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)             ABSOLUTE HUMIDITY  8.1 GM/KG( 56.6 GRAINS/LB)      NOX HUMIDITY C.F.  .9203

BAG RESULTS
  BAG NUMBER                                           1                 2
  BLOWER DIF P MM. H2O(IN. H2O)                  838.2 (33.0)       838.2 (33.0)
  BLOWER INLET P MM. H2O(IN. H2O)                812.8 (32.0)       812.8 (32.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)               42.2 (108.0)       45.6 (114.0)
  BLOWER REVOLUTIONS                              111912              61391
  CVS FLOW STD. CU. METRES(SCF)                  207.8 (7340.5)     113.8 (4018.5)

  HC   SAMPLE METER/RANGE/PPM                    13.2/ 2/    13     12.1/ 2/    12
  HC   BCKGRD METER/RANGE/PPM                    11.6/ 2/    12      9.2/ 2/     9
  CO   SAMPLE METER/RANGE/PPM                    34.0/13/    32     53.4/13/    51
  CO   BCKGRD METER/RANGE/PPM                     1.7/13/     2      1.8/13/     2
  CO2  SAMPLE METER/RANGE/PCT                    76.0/ 3/ 1.39      94.1/ 3/ 1.76
  CO2  BCKGRD METER/RANGE/PCT                     3.1/ 3/  .05       2.9/ 3/  .04
  NOX  SAMPLE METER/RANGE/PPM                    15.7/ 2/    16     22.9/ 2/    23
  NOX  BCKGRD METER/RANGE/PPM                      .8/ 2/     1       .8/ 2/     1

  DILUTION FACTOR                                    9.63              7.57
  HC   CONCENTRATION PPM                             3                 4
  CO   CONCENTRATION PPM                            29                47
  CO2  CONCENTRATION PCT                          1.34              1.73
  NOX  CONCENTRATION PPM                          15.0              22.2

  HC   MASS GRAMS                                  .34               .27
  CO   MASS GRAMS                                 7.11              6.24
  CO2  MASS GRAMS                               5117.4            3595.9
  NOX  MASS GRAMS                                 5.48              4.45

  HC   GRAMS/KM (GRAMS/MILE)                     .02 (   .02)       .02 (   .03)
  CO   GRAMS/KM (GRAMS/MILE)                     .33 (   .52)       .38 (   .61)
  CO2  GRAMS/KM (GRAMS/MILE)                   234.5 ( 377.3)     219.0 ( 352.3)
  NOX  GRAMS/KM (GRAMS/MILE)                     .25 (   .40)       .27 (   .44)
  FUEL CONSUMPTION BY CB L/100KM(MPG)          10.03 ( 23.45)      9.37 ( 25.09)
  CALCULATED DISTANCE KM (MILES)               21.83 ( 13.56)     16.42 ( 10.21)

COMPOSITE FTP RESULTS
  HC   GRAMS/KM (GRAMS/MILE)               .02 (   .03)
  CO   GRAMS/KM (GRAMS/MILE)               .35 (   .56)
  CO2  GRAMS/KM (GRAMS/MILE)            227.82 (366.56)
  NOX  GRAMS/KM (GRAMS/MILE)               .26 (   .42)
  FUEL CONSUMPTION BY CB L/100KM (MPG)    9.75 ( 24.13)
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                              TABLE      VEHICLE EMISSION RESULTS
                                                   FTP
                                                                                   PROJECT NO. 11-4746-001
VEHICLE NO.                                     TEST NO.   06  RUN 1               TEST WEIGHT       0 KG(     -0 LBS)
VEHICLE MODEL    78 VOLVO                       DATE  7/ 6/79                      ACTUAL ROAD LOAD   0.0 KW( -0.0 HP)
ENGINE 2.3 L(140 CID) L-4                       TIME 01:00                         GASOLINE
TRANSMISSION A3                                 DYNO NO.  3                        ODOMETER       -0
GVW     0 KG(     -0 LBS)                       CVS NO.   2
                                                BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)             RELATIVE HUMIDITY 63 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)           ABSOLUTE HUMIDITY 12.9 GM/KG( 90.4 GRAINS/LB)     NOX HUMIDITY C.F. 1.0781

BAG RESULTS
   BAG NUMBER                                         1                  2                  3
   DESCRIPTION                                 COLD TRANSIENT       STABILIZED        HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                927.1 (36.5)       927.1 (36.5)       916.9 (36.1)
   BLOWER INLET P MM. H2O(IN. H2O)              901.7 (35.5)       901.7 (35.5)       889.0 (35.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)             43.3 (110.0)       43.3 (110.0)       43.3 (110.0)
   BLOWER REVOLUTIONS                               40514              69350              40138
   CVS FLOW STD. CU. METRES(SCF)                 73.5 (2595.3)     125.8 (4441.8)      72.9 (2574.4)

   HC   SAMPLE METER/RANGE/PPM                  71.6/ 2/   72      14.7/ 2/   15      19.0/ 2/   19
   HC   BCKGRD METER/RANGE/PPM                   7.9/ 2/    8       6.4/ 2/    6       6.2/ 2/    6
   CO   SAMPLE METER/RANGE/PPM                  85.5/11/  404      17.4/13/   15      27.6/13/   25
   CO   BCKGRD METER/RANGE/PPM                   1.0/11/    3        .7/13/    1        .7/13/    1
   CO2  SAMPLE METER/RANGE/PCT                  71.5/ 3/ 1.29      45.6/ 3/  .78      66.3/ 3/ 1.19
   CO2  BCKGRD METER/RANGE/PCT                   3.1/ 3/  .05       3.3/ 3/  .05       3.1/ 3/  .05
   NOX  SAMPLE METER/RANGE/PPM                  33.3/ 2/   33       4.6/ 2/    5      23.6/ 2/   24
   NOX  BCKGRD METER/RANGE/PPM                    .9/ 2/    1        .4/ 2/    0        .6/ 2/    1

   DILUTION FACTOR                                  10.00              17.05              11.23
   HC   CONCENTRATION PPM                              64                  9                 13
   CO   CONCENTRATION PPM                             383                 14                 23
   CO2  CONCENTRATION PCT                            1.25                .74               1.15
   NOX  CONCENTRATION PPM                            32.5                4.2               23.1

   HC   MASS GRAMS                                   2.73                .63                .56
   CO   MASS GRAMS                                  32.81               2.09               1.97
   CO2  MASS GRAMS                                 1684.8             1693.6             1529.6
   NOX  MASS GRAMS                                   4.92               1.10               3.47

   HC   GRAMS/KM (GRAMS/MILE)                    .47 (   .76)      .10 (   .16)      .10 (   .16)
   CO   GRAMS/KM (GRAMS/MILE)                   5.70 (  9.17)      .34 (   .55)      .34 (   .56)
   CO2  GRAMS/KM (GRAMS/MILE)                  292.7 ( 471.0)    275.1 ( 442.6)    267.5 ( 430.4)
   NOX  GRAMS/KM (GRAMS/MILE)                    .86 (  1.38)      .18 (   .29)      .61 (   .98)
   FUEL CONSUMPTION BY CB L/100KM(MPG)         12.94 ( 18.18)    11.78 ( 19.97)    11.45 ( 20.54)
   CALCULATED DISTANCE KM (MILES)               5.76 (  3.58)     6.16 (  3.83)     5.72 (  3.55)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)          .18 (   .29)
   CO   GRAMS/KM (GRAMS/MILE)         1.45 (  2.34)
   CO2  GRAMS/KM (GRAMS/MILE)       276.66 (445.14)
   NOX  GRAMS/KM (GRAMS/MILE)          .44 (   .70)
   FUEL CONSUMPTION BY CB L/100KM (MPG)  11.93 ( 19.72)
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                          TABLE       VEHICLE EMISSION RESULTS
                                              HFET
                                                                                   PROJECT NO. 11-4746-001
VEHICLE NO.
VEHICLE MODEL   78                        TEST NO.   06  RUN 1                   TEST WEIGHT   1591 KG(  3500 LBS)
ENGINE 2.3 L(140 CID) L-4                 DATE  7/ 6/79                          ACTUAL ROAD LOAD   0.0 KW( -0.0 HP)
TRANSMISSION A3                           TIME                                   GASOLINE
GVW     0 KG(    -0 LBS)                  DYNO NO.  3                            ODOMETER       -0
                                          CVS NO.   2
                                          BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)       RELATIVE HUMIDITY 63 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)     ABSOLUTE HUMIDITY 12.9 GM/KG( 90.4 GRAINS/LB)      NOX HUMIDITY C.F. 1.0781

BAG RESULTS
   BAG NUMBER                                   1
   BLOWER DIF P MM. H2O(IN. H2O)           944.9 (37.2)
   BLOWER INLET P MM. H2O(IN. H2O)         914.4 (36.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)        43.3 (110.0)
   BLOWER REVOLUTIONS                          61172
   CVS FLOW STD. CU. METRES(SCF)           110.7 (3910.2)

   HC  SAMPLE METER/RANGE/PPM              17.3/ 2/   17
   HC  BCKGRD METER/RANGE/PPM              10.5/ 2/   10
   CO  SAMPLE METER/RANGE/PPM              13.1/13/   12
   CO  BCKGRD METER/RANGE/PPM                .6/13/    1
   CO2 SAMPLE METER/RANGE/PCT              94.5/ 3/ 1.77
   CO2 BCKGRD METER/RANGE/PCT               4.6/ 3/  .07
   NOX SAMPLE METER/RANGE/PPM              34.0/ 2/   34
   NOX BCKGRD METER/RANGE/PPM               1.5/ 2/    2

   DILUTION FACTOR                              7.55
   HC  CONCENTRATION PPM                         8
   CO  CONCENTRATION PPM                        10
   CO2 CONCENTRATION PCT                       1.71
   NOX CONCENTRATION PPM                       32.7

   HC  MASS GRAMS                               .52
   CO  MASS GRAMS                              1.35
   CO2 MASS GRAMS                            3469.7
   NOX MASS GRAMS                              7.47

   HC  GRAMS/KM (GRAMS/MILE)                 .03 (   .05)
   CO  GRAMS/KM (GRAMS/MILE)                 .08 (   .13)
   CO2 GRAMS/KM (GRAMS/MILE)               215.9 ( 347.4)
   NOX GRAMS/KM (GRAMS/MILE)                 .46 (   .75)
   FUEL CONSUMPTION BY CB L/100KM(MPG)      9.23 ( 25.50)
   CALCULATED DISTANCE KM (MILES)          16.07 (  9.99)
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                                 TABLE      VEHICLE EMISSION RESULTS
                                                  SET-7
                                                                                PROJECT NO. 11-4746-001
VEHICLE NO.
VEHICLE MODEL    78                        TEST NO.   06   RUN 1                  TEST WEIGHT    1591 KG(  3500 LBS)
ENGINE 2.3 L(140 CID) L-4                  DATE  7/ 6/79                          ACTUAL ROAD LOAD    0.0 KW( -0.0 HP)
TRANSMISSION A3                            TIME 03:00                             GASOLINE
GVW     0 KG(     -0 LBS)                  DYNO NO.  3                            ODOMETER       -0
                                           CVS NO.   2
                                           BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)        RELATIVE HUMIDITY 63 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)      ABSOLUTE HUMIDITY 12.9 GM/KG( 90.4 GRAINS/LB)      NOX HUMIDITY C.F. 1.0781

BAG RESULTS
  BAG NUMBER                                      1
  BLOWER DIF P MM. H2O(IN. H2O)              914.4 (36.0)
  BLOWER INLET P MM. H2O(IN. H2O)            889.0 (35.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)           43.3 (110.0)
  BLOWER REVOLUTIONS                            111699
  CVS FLOW STD. CU. METRES(SCF)              202.9 (7167.5)

  HC  SAMPLE METER/RANGE/PPM                 17.8/ 2/   18
  HC  BCKGRD METER/RANGE/PPM                 11.4/ 2/   11
  CO  SAMPLE METER/RANGE/PPM                 19.8/13/   18
  CO  BCKGRD METER/RANGE/PPM                   .7/13/    1
  CO2 SAMPLE METER/RANGE/PCT                 76.2/ 3/ 1.39
  CO2 BCKGRD METER/RANGE/PCT                  4.0/ 3/  .06
  NOX SAMPLE METER/RANGE/PPM                 20.6/ 2/   21
  NOX BCKGRD METER/RANGE/PPM                  1.5/ 2/    2

  DILUTION FACTOR                                9.61
  HC  CONCENTRATION PPM                            8
  CO  CONCENTRATION PPM                           16
  CO2 CONCENTRATION PCT                          1.34
  NOX CONCENTRATION PPM                          19.3

  HC  MASS GRAMS                                  .89
  CO  MASS GRAMS                                 3.84
  CO2 MASS GRAMS                               4965.7
  NOX MASS GRAMS                                 8.06

  HC  GRAMS/KM (GRAMS/MILE)                   .04 (    .07)
  CO  GRAMS/KM (GRAMS/MILE)                   .18 (    .29)
  CO2 GRAMS/KM (GRAMS/MILE)                 231.4 (  372.2)
  NOX GRAMS/KM (GRAMS/MILE)                   .38 (    .60)
  FUEL CONSUMPTION BY CB L/100KM(MPG)        9.89 (  23.78)
  CALCULATED DISTANCE KM (MILES)            21.46 (  13.34)
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                         TABLE      VEHICLE EMISSION RESULTS
                                              FTP                                          PROJECT NO. 11-4746-001

VEHICLE NO.  244                                  TEST NO.    6  RUN 2                TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                    DATE  7/10/79                       ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                         TIME 12155                          GASOLINE EM-274-F
TRANSMISSION A3                                   DYNO NO.  3                         ODOMETER   25059
GVW      0 KG(     -0 LBS)                        CVS NO.   2
                                                  BAG CART NO.  1

BAROMETER 738.89 MM HG(29.09 IN HG)               RELATIVE HUMIDITY 60 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)             ABSOLUTE HUMIDITY 12.2 GM/KG( 85.1 GRAINS/LB)      NOX HUMIDITY C.F. 1.0499

BAG RESULTS
   BAG NUMBER                                         1                     2                     3
   DESCRIPTION                                 COLD TRANSIENT          STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                901.7 (35.5)          901.7 (35.5)          901.7 (35.5)
   BLOWER INLET P MM. H2O(IN. H2O)              876.3 (34.5)          876.3 (34.5)          876.3 (34.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)             43.9 (111.0)          43.3 (110.0)          44.4 (112.0)
   BLOWER REVOLUTIONS                              40451                 69376                 40335
   CVS FLOW STD. CU. METRES(SCF)                 73.5 (2597.4)        126.2 (4458.0)         73.2 (2586.9)

   HC   SAMPLE METER/RANGE/PPM                  81.1/ 2/    81        14.0/ 2/    14        20.5/ 2/    20
   HC   BCKGRD METER/RANGE/PPM                   6.9/ 2/     7         6.0/ 2/     6         6.3/ 2/     6
   CO   SAMPLE METER/RANGE/PPM                  93.8/11/   475        25.3/13/    23        53.3/13/    51
   CO   BCKGRD METER/RANGE/PPM                    .8/11/     2         1.4/13/     1         1.3/13/     1
   CO2 SAMPLE METER/RANGE/PCT                   70.0/ 3/ 1.26         46.6/ 3/  .80         63.3/ 3/ 1.13
   CO2 BCKGRD METER/RANGE/PCT                    3.5/ 3/  .05          3.5/ 3/  .05          3.2/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                   30.8/ 2/    31         4.0/ 2/     4        20.3/ 2/    20
   NOX BCKGRD METER/RANGE/PPM                    1.4/ 2/     1          .9/ 2/     1          .7/ 2/     1

   DILUTION FACTOR                                 10.17                 16.63                 11.60
   HC   CONCENTRATION PPM                            75                     8                    15
   CO   CONCENTRATION PPM                           453                    21                    48
   CO2 CONCENTRATION PCT                           1.22                   .75                  1.08
   NOX CONCENTRATION PPM                           29.5                   3.2                  19.7

   HC   MASS GRAMS                                  3.18                   .61                   .62
   CO   MASS GRAMS                                 38.76                  3.05                  4.05
   CO2 MASS GRAMS                                 1637.4                1737.2                1453.9
   NOX MASS GRAMS                                   4.36                   .80                  2.89

   HC   GRAMS/KM (GRAMS/MILE)                     .56 (   .90)          .10 (   .16)          .11 (   .18)
   CO   GRAMS/KM (GRAMS/MILE)                    6.83 ( 11.00)          .50 (   .80)          .71 (  1.15)
   CO2 GRAMS/KM (GRAMS/MILE)                    288.7 ( 464.5)        284.4 ( 457.6)        256.0 ( 411.8)
   NOX GRAMS/KM (GRAMS/MILE)                      .77 (  1.24)          .13 (   .21)          .51 (   .82)
   FUEL CONSUMPTION BY CB L/100KM(MPG)          12.86 ( 18.30)        12.19 ( 19.30)        10.99 ( 21.41)
   CALCULATED DISTANCE KM (MILES)                5.67 (  3.53)         6.11 (  3.80)         5.68 (  3.53)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)            .20 (   .32)
   CO   GRAMS/KM (GRAMS/MILE)           1.87 (  3.01)
   CO2 GRAMS/KM (GRAMS/MILE)          277.49 (446.48)
   NOX GRAMS/KM (GRAMS/MILE)             .37 (   .59)
   FUEL CONSUMPTION BY CB L/100KM (MPG)  12.00 ( 19.61)
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                                   TABLE      VEHICLE EMISSION RESULTS
                                                      SET
                                                                                  PROJECT NO. 11-4746-001
VEHICLE NO. 244                                TEST NO.     6  RUN 2
VEHICLE MODEL    78 VOLVO 244DL                DATE  7/10/79                     TEST WEIGHT   1591 KG(  3500 LBS)
ENGINE 2.1 L(130 CID) L-4                      TIME 14:48                        ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
TRANSMISSION A3                                DYNO NO.  3                       GASOLINE EM-274-F
GVW      0 KG(    -0 LBS)                      CVS NO.   2                       ODOMETER   26401
                                               BAG CART NO.  1

BAROMETER 737.87 MM HG(29.05 IN HG)            RELATIVE HUMIDITY 45 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)          ABSOLUTE HUMIDITY  8.9 GM/KG( 62.0 GRAINS/LB)      NOX HUMIDITY C.F.   .9425

BAG RESULTS
   BAG NUMBER                                       1
   BLOWER DIF P MM. H2O(IN. H2O)              901.7 (35.5)
   BLOWER INLET P MM. H2O(IN. H2O)            876.3 (34.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)           44.4 (112.0)
   BLOWER REVOLUTIONS                            111769
   CVS FLOW STD. CU. METRES(SCF)              202.6 (7157.4)

   HC   SAMPLE METER/RANGE/PPM                15.2/ 2/   15
   HC   BCKGRD METER/RANGE/PPM                 7.5/ 2/    8
   CO   SAMPLE METER/RANGE/PPM                18.3/13/   16
   CO   BCKGRD METER/RANGE/PPM                  .9/13/    1
   CO2  SAMPLE METER/RANGE/PCT                73.6/ 3/ 1.34
   CO2  BCKGRD METER/RANGE/PCT                 3.9/ 3/  .06
   NOX  SAMPLE METER/RANGE/PPM                18.8/ 2/   19
   NOX  BCKGRD METER/RANGE/PPM                 1.1/ 2/    1

   DILUTION FACTOR                                9.99
   HC   CONCENTRATION PPM                            8
   CO   CONCENTRATION PPM                           15
   CO2  CONCENTRATION PCT                         1.28
   NOX  CONCENTRATION PPM                         17.8

   HC   MASS GRAMS                                 .99
   CO   MASS GRAMS                                3.51
   CO2  MASS GRAMS                              4764.7
   NOX  MASS GRAMS                                6.51

   HC   GRAMS/KM (GRAMS/MILE)                  .05 (   .07)
   CO   GRAMS/KM (GRAMS/MILE)                  .17 (   .27)
   CO2  GRAMS/KM (GRAMS/MILE)                224.2 ( 360.7)
   NOX  GRAMS/KM (GRAMS/MILE)                  .31 (   .49)
   FUEL CONSUMPTION BY CB L/100KM(MPG)        9.59 ( 24.54)
   CALCULATED DISTANCE KM (MILES)            21.25 ( 13.21)
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                              TABLE      VEHICLE EMISSION RESULTS                          PROJECT NO. 11-4746-001
                                                   FET
                                                                                 TEST WEIGHT   1591 KG( 3500 LBS)
VEHICLE NO.  244                           TEST NO.    6  RUN 2                  ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
VEHICLE MODEL   78 VOLVO 244DL             DATE  7/10/79                         GASOLINE EM-274-F
ENGINE 0.0 L( -0 CID) L-4                  TIME 15:31                            ODOMETER   25087
TRANSMISSION A3                            DYNO NO.  3
GVW     0 KG(    -0 LBS)                   CVS NO.   2
                                           BAG CART NO.  1

BAROMETER 737.87 MM HG(29.05 IN HG)        RELATIVE HUMIDITY 55 PCT
DRY BULB TEMP. 27.2 DEG C(81.0 DEG F)      ABSOLUTE HUMIDITY 12.7 GM/KG( 89.2 GRAINS/LB)      NOX HUMIDITY C.F. 1.0717

BAG RESULTS
   BAG NUMBER                                     1
   BLOWER DIF P MM. H2O(IN. H2O)           901.7 (35.5)
   BLOWER INLET P MM. H2O(IN. H2O)         876.3 (34.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)        44.4 (112.0)
   BLOWER REVOLUTIONS                          61248
   CVS FLOW STD. CU. METRES(SCF)           111.1 (3922.4)

   HC  SAMPLE METER/RANGE/PPM              17.6/ 2/   18
   HC  BCKGRD METER/RANGE/PPM               8.1/ 2/    8
   CO  SAMPLE METER/RANGE/PPM              33.0/13/   30
   CO  BCKGRD METER/RANGE/PPM               1.1/13/    1
   CO2 SAMPLE METER/RANGE/PCT              93.1/ 3/ 1.74
   CO2 BCKGRD METER/RANGE/PCT               4.9/ 3/  .08
   NOX SAMPLE METER/RANGE/PPM              33.6/ 2/   34
   NOX BCKGRD METER/RANGE/PPM               1.3/ 2/    1

   DILUTION FACTOR                              7.67
   HC  CONCENTRATION PPM                         11
   CO  CONCENTRATION PPM                         28
   CO2 CONCENTRATION PCT                        1.68
   NOX CONCENTRATION PPM                        32.5

   HC  MASS GRAMS                                .68
   CO  MASS GRAMS                               3.58
   CO2 MASS GRAMS                             3412.1
   NOX MASS GRAMS                               7.39

   HC  GRAMS/KM (GRAMS/MILE)                .04 (   .07)
   CO  GRAMS/KM (GRAMS/MILE)                .22 (   .36)
   CO2 GRAMS/KM (GRAMS/MILE)              210.8 ( 339.2)
   NOX GRAMS/KM (GRAMS/MILE)                .46 (   .73)
   FUEL CONSUMPTION BY CB L/100KM(MPG)     9.02 ( 26.09)
   CALCULATED DISTANCE KM (MILES)         16.19 ( 10.06)
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                                        TABLE      VEHICLE EMISSION RESULTS                                     PROJECT NO. 11-4746-001
                                                           FTP
                                                                                                     TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE NO.  244                                     TEST NO.    6  RUN 2                            ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
VEHICLE MODEL   78 VOLVO  244DL                      DATE  8/ 7/79                                   GASOLINE EM-274-F
ENGINE 2.1 L(130 CID) V-8                            TIME 09:14                                      ODOMETER    29929
TRANSMISSION A3                                    * DYNO NO.  3
GVW     0 KG(     -0 LBS)                            CVS NO.   2
                                                     BAG CART NO.  1

BAROMETER 744.24 MM HG(29.34 IN HG)                  RELATIVE HUMIDITY 67 PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)                ABSOLUTE HUMIDITY 13.0 GM/KG( 91.2 GRAINS/LB)       NOX HUMIDITY C.F. 1,0826

BAG RESULTS
   BAG NUMBER                                          1                      2                      3
   DESCRIPTION                                   COLD TRANSIENT          STABILIZED           HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                  914.4 (36.0)          914.4 (36.0)          914.4 (36.0)
   BLOWER INLET P MM. H2O(IN. H2O)                889.0 (35.0)          889.0 (35.0)          889.0 (35.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)               43.3 (110.0)          43.3 (110.0)          43.3 (110.0)
   BLOWER REVOLUTIONS                                 40591                 69458                 40375
   CVS FLOW STD. CU. METRES(SCF)                   74.5 (2629.7)       127.4 (4498.7)         74.0 (2615.0)

   HC  SAMPLE METER/RANGE/PPM                    9.3/ 3/   93          9.3/ 2/    9          15.2/ 2/   15
   HC  BCKGRD METER/RANGE/PPM                     .8/ 3/    8          6.6/ 2/    7           5.8/ 2/    6
   CO  SAMPLE METER/RANGE/PPM                   90.5/11/  446         23.8/13/   21          60.0/13/   58
   CO  BCKGRD METER/RANGE/PPM                    2.5/11/    7          2.3/13/    2           1.6/13/    1
   CO2 SAMPLE METER/RANGE/PCT                   71.4/ 3/ 1.29         47.0/ 3/  .81          64.4/ 3/ 1.15
   CO2 BCKGRD METER/RANGE/PCT                    3.7/ 3/  .06          3.7/ 3/  .06           3.6/ 3/  .06
   NOX SAMPLE METER/RANGE/PPM                   27.3/ 2/   27          5.8/ 2/    6          21.6/ 2/   22
   NOX BCKGRD METER/RANGE/PPM                    1.4/ 2/    1           .9/ 2/    1            .9/ 2/    1

   DILUTION FACTOR                                   9.97                 16.49                 11.57
   HC  CONCENTRATION PPM                             86                      3                    10
   CO  CONCENTRATION PPM                            419                     19                    54
   CO2 CONCENTRATION PCT                            1.24                   .76                  1.10
   NOX CONCENTRATION PPM                            26.0                   5.0                  20.8

   HC  MASS GRAMS                                   3.68                   .23                   .42
   CO  MASS GRAMS                                  36.31                  2.77                  4.65
   CO2 MASS GRAMS                                 1693.0                1764.1                1492.1
   NOX MASS GRAMS                                   4.02                  1.31                  3.19

   HC  GRAMS/KM (GRAMS/MILE)                    .64 (  1.04)         .04 (   .06)          .07 (   .12)
   CO  GRAMS/KM (GRAMS/MILE)                   6.35 ( 10.22)         .45 (   .72)          .81 (  1.30)
   CO2 GRAMS/KM (GRAMS/MILE)                  296.2 ( 476.6)       286.0 ( 460.2)        259.9 ( 418.2)
   NOX GRAMS/KM (GRAMS/MILE)                    .70 (  1.13)         .21 (   .34)          .55 (   .89)
   FUEL CONSUMPTION BY CB L/100KM(MPG)        13.16 ( 17.88)       12.24 ( 19.22)        11.16 ( 21.08)
   CALCULATED DISTANCE KM (MILES)              5.72 (  3.55)        6.17 (  3.83)         5.74 (  3.57)

COMPOSITE FTP RESULTS
   HC  GRAMS/KM (GRAMS/MILE)             .17 (   .28)
   CO  GRAMS/KM (GRAMS/MILE)            1.77 (  2.85)
   CO2 GRAMS/KM (GRAMS/MILE)          280.94 (452.03)
   NOX GRAMS/KM (GRAMS/MILE)             .41 (   .66)
   FUEL CONSUMPTION BY CB L/100KM (MPG) 12.13 ( 19.39)
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                                   TABLE      VEHICLE EMISSION RESULTS
                                                      SET                                    PROJECT NO. 11-4746-001

VEHICLE NO.  244                               TEST NO.    6  RUN 2                  TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                 DATE  8/ 7 /79                        ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) V-8                      TIME 14:08                            GASOLINE EM-274-F
TRANSMISSION A3                                DYNO NO.  3                           ODOMETER   29900
GVW     0 KG(    -0 LBS)                       CVS NO.   2
                                               BAG CART NO.  1

BAROMETER 743.20 MM HG(29.26 IN HG)            RELATIVE HUMIDITY 50 PCT
DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)          ABSOLUTE HUMIDITY 10.8 GM/KG( 75.9 GRAINS/LB)      NOX HUMIDITY C.F. 1.0044

BAG RESULTS
   BAG NUMBER                                        1
   BLOWER DIF P MM. H2O(IN. H2O)               914.4 (36.0)
   BLOWER INLET P MM. H2O(IN. H8O)             889.0 (35.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)            43.9 (111.0)
   BLOWER REVOLUTIONS                             111805
   CVS FLOW STD. CU. METRES(SCF)               204.2 (7212.1)

   HC  SAMPLE METER/RANGE/PPM                    9.7/ 2/   10
   HC  BCKGRD METER/RANGE/PPM                    6.4/ 2/    6
   CO  SAMPLE METER/RANGE/PPM                   17.1/13/   15
   CO  BCKGRD METER/RANGE/PPM                     .7/13/    1
   CO2 SAMPLE METER/RANGE/PCT                   78.6/ 3/ 1.44
   CO2 BCKGRD METER/RANGE/PCT                    3.5/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                   28.7/ 2/   29
   NOX BCKGRD METER/RANGE/PPM                    1.9/ 2/    2

   DILUTION FACTOR                                   9.29
   HC  CONCENTRATION PPM                                4
   CO  CONCENTRATION PPM                               14
   CO2 CONCENTRATION PCT                             1.39
   NOX CONCENTRATION PPM                             27.0

   HC  MASS GRAMS                                     .47
   CO  MASS GRAMS                                    3.31
   CO2 MASS GRAMS                                  5208.5
   NOX MASS GRAMS                                   10.59

   HC  GRAMS/KM (GRAMS/MILE)                     .02 (   .04)
   CO  GRAMS/KM (GRAMS/MILE)                     .15 (   .25)
   CO2 GRAMS/KM (GRAMS/MILE)                   242.2 ( 389.7)
   NOX GRAMS/KM (GRAMS/MILE)                     .49 (   .79)
   FUEL CONSUMPTION BY CB L/100KM(MPG)         10.35 ( 22.73)
   CALCULATED DISTANCE KM (MILES)              21.51 ( 13.37)
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                              TABLE      VEHICLE EMISSION RESULTS
                                                    FET
                                                                                          PROJECT NO. 11-4746-001
VEHICLE NO.  244                                  TEST NO.    6  RUN 2                  TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                    DATE  8/7 /79                         ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) V-8                         TIME 15:40                            GASOLINE EM-274F
TRANSMISSION A3                                   DYNO NO.  3                           ODOMETER   29913
GVW     0 KG(    -0 LBS)                          CVS NO.   2
                                                  BAG CART NO.  1

BAROMETER 743.20 MM HG(29.26 IN HG)               RELATIVE HUMIDITY 48 PCT
DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)             ABSOLUTE HUMIDITY 10.6 GM/KG( 74.3 GRAINS/LB)      NOX HUMIDITY C.F.  .9965

BAG RESULTS
  BAG NUMBER                                              1
  BLOWER DIF P MM. H2O(IN. H2O)                  914.4 (36.0)
  BLOWER INLET P MM. H2O(IN. H2O)                889.0 (35.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)               43.3 (110.0)
  BLOWER REVOLUTIONS                                  61218
  CVS FLOW STD. CU. METRES(SCF)                  111.9 (3952.7)

  HC   SAMPLE METER/RANGE/PPM                    10.3/ 2/   10
  HC   BCKGRD METER/RANGE/PPM                     6.4/ 2/    6
  CO   SAMPLE METER/RANGE/PPM                    26.7/13/   24
  CO   BCKGRD METER/RANGE/PPM                      .6/13/    1
  CO2  SAMPLE METER/RANGE/PCT                    95.5/ 3/ 1.79
  CO2  BCKGRD METER/RANGE/PCT                     3.6/ 3/  .06
  NOX  SAMPLE METER/RANGE/PPM                    43.0/ 2/   43
  NOX  BCKGRD METER/RANGE/PPM                     1.8/ 2/    2

  DILUTION FACTOR                                     7.46
  HC   CONCENTRATION PPM                                 5
  CO   CONCENTRATION PPM                                22
  CO2  CONCENTRATION PCT                              1.75
  NOX  CONCENTRATION PPM                              41.4

  HC   MASS GRAMS                                      .31
  CO   MASS GRAMS                                     2.91
  CO2  MASS GRAMS                                   3578.3
  NOX  MASS GRAMS                                     8.84

  HC   GRAMS/KM (GRAMS/MILE)                      .02 (   .03)
  CO   GRAMS/KM (GRAMS/MILE)                      .18 (   .29)
  CO2  GRAMS/KM (GRAMS/MILE)                    219.3 ( 352.9)
  NOX  GRAMS/KM (GRAMS/MILE)                      .54 (   .87)
  FUEL CONSUMPTION BY CB L/100KM(MPG)            9.38 ( 25.09)
  CALCULATED DISTANCE KM (MILES)                16.32 ( 10.14)
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                          TABLE      VEHICLE EMISSION RESULTS                         PROJECT NO. 11-4746-001
                                               FTP
                                         TEST NO.     6  RUN 3                TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE NO.  244                         DATE  8/ 8/79                        ACTUAL ROAD LOAD    9.2 Kw( 12.3 HP)
VEHICLE MODEL    78 VOLVO 244 DL         TIME 09:17                           GASOLINE EM-274-F
ENGINE 2.1 L(130 CID) V-8                DYNO NO.  3                          ODOMETER   29951
TRANSMISSION A3                          CVS NO.   2
GVW     0 KG(    -0 LBS)                 BAG CART NO.  1

BAROMETER 743.20 MM HG(29.26 IN HG)      RELATIVE HUMIDITY 54 PCT
DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)    ABSOLUTE HUMIDITY  9.9 GM/KG( 69.5 GRAINS/LB)     NOX HUMIDITY C.F.  .9748

BAG RESULTS
   BAG NUMBER                                   1                  2                  3
   DESCRIPTION                            COLD TRANSIENT       STABILIZED        HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)           927.1 (36.5)       927.1 (36.5)       927.1 (36.5)
   BLOWER INLET P MM. H2O(IN. H2O)         901.7 (35.5)       901.7 (35.5)       901.7 (35.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)        43.3 (110.0)       42.2 (108.0)       43.3 (110.0)
   BLOWER REVOLUTIONS                         40555              69609              40453
   CVS FLOW STD. CU. METRES(SCF)            74.0 (2614.4)     127.3 (4495.6)      73.8 (2607.5)

   HC  SAMPLE METER/RANGE/PPM              91.3/ 2/   91      13.0/ 2/   13      22.5/ 2/   23
   HC  BCKGRD METER/RANGE/PPM               8.9/ 2/    9       9.6/ 2/   10      10.4/ 2/   10
   CO  SAMPLE METER/RANGE/PPM              92.0/11/  459      14.6/13/   13      60.9/13/   59
   CO  BCKGRD METER/RANGE/PPM               1.6/11/    5       2.6/13/    2       1.4/13/    1
   CO2 SAMPLE METER/RANGE/PCT              71.3/ 3/ 1.29      46.8/ 3/  .81      63.1/ 3/ 1.12
   CO2 BCKGRD METER/RANGE/PCT               3.0/ 3/  .05       3.0/ 3/  .05       3.2/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM              28.0/ 2/   28       9.5/ 2/   10      20.7/ 2/   21
   NOX BCKGRD METER/RANGE/PPM               1.2/ 2/    1       1.1/ 2/    1       1.3/ 2/    1

   DILUTION FACTOR                              9.97              16.58              11.83
   HC  CONCENTRATION PPM                        83                  4                 13
   CO  CONCENTRATION PPM                       436                 10                 55
   CO2 CONCENTRATION PCT                        1.25               .76               1.08
   NOX CONCENTRATION PPM                       26.9                8.5               19.5

   HC  MASS GRAMS                               3.56               .29                .55
   CO  MASS GRAMS                              37.54              1.54               4.76
   CO2 MASS GRAMS                            1693.6             1777.7             1460.1
   NOX MASS GRAMS                               3.72              2.01               2.69

   HC  GRAMS/KM (GRAMS/MILE)                 .62 (  1.00)      .05 (   .08)      .10 (   .16)
   CO  GRAMS/KM (GRAMS/MILE)                6.56 ( 10.55)      .25 (   .40)      .83 (  1.34)
   CO2 GRAMS/KM (GRAMS/MILE)               295.8 ( 476.0)    288.0 ( 463.3)    255.0 ( 410.4)
   NOX GRAMS/KM (GRAMS/MILE)                 .65 (  1.04)      .33 (   .52)      .47 (   .75)
   FUEL CONSUMPTION BY CB L/100KM(MPG)     13.15 ( 17.89)    12.31 ( 19.10)    10.95 ( 21.47)
   CALCULATED DISTANCE KM (MILES)           5.72 (  3.56)     6.17 (  3.84)     5.72 (  3.56)

 COMPOSITE FTP RESULTS
   HC  GRAMS/KM (GRAMS/MILE)            .18 (   .29)
   CO  GRAMS/KM (GRAMS/MILE)           1.71 (  2.76)
   CO2 GRAMS/KM (GRAMS/MILE)         280.56 (451.41)
   NOX GRAMS/KM (GRAMS/MILE)            .43 (   .69)
   FUEL CONSUMPTION BY CB L/100KM (MPG) 12.11 ( 19.42)
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                                   TABLE     VEHICLE EMISSION RESULTS
                                                    FET
                                                                                    PROJECT NO, 11-4746-001
VEHICLE NO,  244
VEHICLE MODEL    78 VOLVO 244DL                TEST NO,    6  RUN 3                 TEST WEIGHT    1591 KG(  3500 LBS)
ENGINE 2,1 L(130 CID) V-8                      DATE  8/ 8/79                        ACTUAL ROAD LOAD    9,2 KW( 12,3 HP)
TRANSMISSION A3                                TIME 11:45                           GASOLINE EM-274-F
GVW      0 KG(     -0 LBS)                     DYNO NO,  3                          ODOMETER    29977
                                               CVS NO,   2
                                               BAG CART NO,  1

BAROMETER 743,46 MM HG(29,27 IN HG)            RELATIVE HUMIDITY 56 PCT
DRY BULB TEMP. 25,0 DEG C(77,0 DEG F)          ABSOLUTE HUMIDITY 11,3 GM/KG( 79,3 GRAINS/LB)      NOX HUMIDITY C,F, 1,0206

BAG RESULTS
  BAG NUMBER                                           1
  BLOWER DIF P MM, H2O(IN, H2O)                927,1 (36,5)
  BLOWER INLET P MM, H2O(IN, H2O)              901,7 (35,5)
  BLOWER INLET TEMP, DEG, C(DEG, F)             43,3 (110,0)
  BLOWER REVOLUTIONS                               61364
  CVS FLOW STD, CU, METRES(SCF)                112,0 (3956,8)

  HC  SAMPLE METER/RANGE/PPM                   13,3/ 2/   13
  HC  BCKGRD METER/RANGE/PPM                    7,9/ 2/    8
  CO  SAMPLE METER/RANGE/PPM                   61,7/13/   60
  CO  BCKGRD METER/RANGE/PPM                    1,5/13/    1
  CO2 SAMPLE METER/RANGE/PCT                   92,7/ 3/ 1,73
  CO2 BCKGRD METER/RANGE/PCT                    2,8/ 3/  ,04
  NOX SAMPLE METER/RANGE/PPM                   24,8/ 2/   25
  NOX BCKGRD METER/RANGE/PPM                    1,1/ 2/    1

  DILUTION FACTOR                                  7,69
  HC  CONCENTRATION PPM                               6
  CO  CONCENTRATION PPM                              55
  CO2 CONCENTRATION PCT                            1,70
  NOX CONCENTRATION PPM                            23,8

  HC  MASS GRAMS                                    ,42
  CO  MASS GRAMS                                   7,23
  CO2 MASS GRAMS                                 3482,9
  NOX MASS GRAMS                                   5,21

  HC  GRAMS/KM (GRAMS/MILE)                     ,03 (   ,04)
  CO  GRAMS/KM (GRAMS/MILE)                     ,45 (   ,72)
  CO2 GRAMS/KM (GRAMS/MILE)                   216,8 ( 348,8)
  NOX GRAMS/KM (GRAMS/MILE)                     ,32 (   ,52)
  FUEL CONSUMPTION BY CB L/100KM(MPG)          9,29 ( 25,34)
  CALCULATED DISTANCE KM (MILES)              16,07 (  9,99)
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                                    TABLE      VEHICLE EMISSION RESULTS
                                                         SET                                      PROJECT NO. 11-4746-001

VEHICLE NO.  244                                   TEST NO.    6  RUN 3                    TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                     DATE  8/ 8/79                           ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) V-8                          TIME 11:16                              GASOLINE EM-274-F
TRANSMISSION A3                                    DYNO NO.  3                             ODOMETER   29965
GVW      0 KG(    -0 LBS)                          CVS NO.   2
                                                   BAG CART NO.  1

BAROMETER 743.71 MM HG(29.28 IN HG)                RELATIVE HUMIDITY 63 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)              ABSOLUTE HUMIDITY 12.8 GM/KG( 89.7 GRAINS/LB)      NOX HUMIDITY C.F. 1.0745

BAG RESULTS
  BAG NUMBER                                              1
  BLOWER DIF P MM. H2O(IN. H2O)                   927.1 (36.5)
  BLOWER INLET P MM. H2O(IN. H2O)                 901.7 (35.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)                43.3 (110.0)
  BLOWER REVOLUTIONS                                 112021
  CVS FLOW STD. CU. METRES(SCF)                   204.6 (7226.2)

  HC   SAMPLE METER/RANGE/PPM                     13.5/ 2/    13
  HC   BCKGRD METER/RANGE/PPM                      8.1/ 2/     8
  CO   SAMPLE METER/RANGE/PPM                     45.1/13/    42
  CO   BCKGRD METER/RANGE/PPM                       .9/13/     1
  CO2  SAMPLE METER/RANGE/PCT                     78.8/ 3/  1.38
  CO2  BCKGRD METER/RANGE/PCT                      2.8/ 3/   .04
  NOX  SAMPLE METER/RANGE/PPM                     17.7/ 2/    18
  NOX  BCKGRD METER/RANGE/PPM                      1.1/ 2/     1

  DILUTION FACTOR                                      9.65
  HC   CONCENTRATION PPM                                  6
  CO   CONCENTRATION PPM                                 39
  CO2  CONCENTRATION PCT                               1.34
  NOX  CONCENTRATION PPM                               16.7

  HC   MASS GRAMS                                       .74
  CO   MASS GRAMS                                      9.39
  CO2  MASS GRAMS                                    5037.8
  NOX  MASS GRAMS                                      7.03

  HC   GRAMS/KM (GRAMS/MILE)                        .03 (    .06)
  CO   GRAMS/KM (GRAMS/MILE)                        .44 (    .71)
  CO2  GRAMS/KM (GRAMS/MILE)                      235.4 ( 378.8)
  NOX  GRAMS/KM (GRAMS/MILE)                        .33 (    .53)
  FUEL CONSUMPTION BY CB L/100KM(MPG)             10.08 ( 23.33)
  CALCULATED DISTANCE KM (MILES)                  21.40 ( 13.30)
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                                   TABLE      VEHICLE EMISSION RESULTS
                                                        FTP                                   PROJECT NO. 11-4746-001

VEHICLE NO.  244                                   TEST NO.    7  RUN 1                    TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL    78 VOLVO 244DL                    DATE  8/28/79                           ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                          TIME 09113                              GASOLINE
TRANSMISSION A3                                    DYNO NO.  3                             ODOMETER   34967
GVW      0 KG(     -0 LBS)                         CVS NO.   2
                                                   BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)                RELATIVE HUMIDITY 74 PCT
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)              ABSOLUTE HUMIDITY 14.2 GM/KG( 99.3 GRAINS/LB)      NOX HUMIDITY C.F. 1.1288

BAG RESULTS
  BAG NUMBER                                             1                    2                     3
  DESCRIPTION                                     COLD TRANSIENT         STABILIZED          HOT TRANSIENT
  BLOWER DIF P MM. H2O(IN. H2O)                   762.0 (30.0)          762.0 (30.0)         762.0 (30.0)
  BLOWER INLET P MM. H2O(IN. H2O)                 736.6 (29.0)          736.6 (29.0)         736.6 (29.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)                43.3 (110.0)          42.2 (108.0)         42.8 (109.0)
  BLOWER REVOLUTIONS                                 40783                 69783                40514
  CVS FLOW STD. CU. METRES(SCF)                    75.8 (2677.2)        129.9 (4588.6)        75.3 (2661.3)

  HC   SAMPLE METER/RANGE/PPM                     87.0/ 2/    87        11.8/ 2/    12        23.8/ 2/    24
  HC   BCKGRD METER/RANGE/PPM                      7.8/ 2/     8         7.2/ 2/     7         7.2/ 2/     7
  CO   SAMPLE METER/RANGE/PPM                     86.0/11/   408        37.0/13/    34        85.5/12/   206
  CO   BCKGRD METER/RANGE/PPM                      1.0/11/     3         2.8/13/     2         1.2/12/     2
  CO2  SAMPLE METER/RANGE/PCT                     69.6/ 3/ 1.26         44.3/ 3/   .76        60.3/ 3/  1.07
  CO2  BCKGRD METER/RANGE/PCT                      2.8/ 3/   .04         2.7/ 3/   .04         3.0/ 3/   .05
  NOX  SAMPLE METER/RANGE/PPM                     26.5/ 2/    26         5.0/ 2/     5        16.1/ 2/    16
  NOX  BCKGRD METER/RANGE/PPM                       .8/ 2/     1          .8/ 2/     1         1.6/ 2/     2

  DILUTION FACTOR                                     10.28                17.57                12.28
  HC   CONCENTRATION PPM                                 80                    5                   17
  CO   CONCENTRATION PPM                                386                   30                  195
  CO2  CONCENTRATION PCT                               1.22                  .72                 1.03
  NOX  CONCENTRATION PPM                               25.8                  4.2                 14.6

  HC   MASS GRAMS                                      3.50                  .38                  .75
  CO   MASS GRAMS                                     34.08                 4.60                17.13
  CO2  MASS GRAMS                                    1689.9               1711.6               1416.8
  NOX  MASS GRAMS                                      4.22                 1.19                 2.38

  HC   GRAMS/KM (GRAMS/MILE)                        .62 (    .99)       .06 (    .10)        .13 (    .21)
  CO   GRAMS/KM (GRAMS/MILE)                       6.02 (   9.69)       .75 (   1.20)       2.99 (   4.81)
  CO2  GRAMS/KM (GRAMS/MILE)                      298.7 ( 480.7)      277.7 ( 446.9)      247.0 ( 397.4)
  NOX  GRAMS/KM (GRAMS/MILE)                        .75 (   1.20)       .19 (    .31)        .41 (    .67)
  FUEL CONSUMPTION BY CB L/100KM(MPG)             13.24 ( 17.77)      11.91 ( 19.75)      10.76 ( 21.86)
  CALCULATED DISTANCE KM (MILES)                   5.66 (   3.52)      6.16 (   3.83)       5.74 (   3.56)

COMPOSITE FTP RESULTS
  HC   GRAMS/KM (GRAMS/MILE)                 .19 (    .31)
  CO   GRAMS/KM (GRAMS/MILE)                2.45 (   3.94)
  CO2  GRAMS/KM (GRAMS/MILE)              273.61 (440.24)
  NOX  GRAMS/KM (GRAMS/MILE)                 .37 (    .59)
  FUEL CONSUMPTION BY CB L/100KM (MPG)     11.87 ( 19.82)
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                            TABLE      VEHICLE EMISSION RESULTS
                                                   SET                                      PROJECT NO. 11-4746-001

VEHICLE NO.  244                                  TEST NO.     7  RUN 1               TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL    78 VOLVO 244DL                   DATE  8/28/79                        ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                         TIME 11:48                           GASOLINE
TRANSMISSION A3                                   DYNO NO.  3                          ODOMETER   34981
GVW     0 KG(    -0 LBS)                          CVS NO.   2
                                                  BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)               RELATIVE HUMIDITY 57 PCT
DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)             ABSOLUTE HUMIDITY 12.4 GM/KG( 87.0 GRAINS/LB)      NOX HUMIDITY C.F. 1.0598

BAG RESULTS
  BAG NUMBER                                            1
  BLOWER DIF P MM. H2O(IN. H2O)                   762.0 (30.0)
  BLOWER INLET P MM. H2O(IN. H2O)                 736.6 (29.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)                43.3 (110.0)
  BLOWER REVOLUTIONS                                112273
  CVS FLOW STD. CU. METRES(SCF)                   208.6 (7367.6)

  HC   SAMPLE METER/RANGE/PPM                     18.2/ 2/   18
  HC   BCKGRD METER/RANGE/PPM                     11.7/ 2/   12
  CO   SAMPLE METER/RANGE/PPM                     56.9/12/  123
  CO   BCKGRD METER/RANGE/PPM                       .8/12/    1
  CO2  SAMPLE METER/RANGE/PCT                     73.8/ 3/ 1.34
  CO2  BCKGRD METER/RANGE/PCT                      3.1/ 3/  .05
  NOX  SAMPLE METER/RANGE/PPM                     14.2/ 2/   14
  NOX  BCKGRD METER/RANGE/PPM                      1.1/ 2/    1

  DILUTION FACTOR                                       9.89
  HC   CONCENTRATION PPM                                8
  CO   CONCENTRATION PPM                              117
  CO2  CONCENTRATION PCT                             1.30
  NOX  CONCENTRATION PPM                             13.2

  HC   MASS GRAMS                                       .92
  CO   MASS GRAMS                                     28.33
  CO2  MASS GRAMS                                   4963.0
  NOX  MASS GRAMS                                      5.59

  HC   GRAMS/KM (GRAMS/MILE)                        .04 (   .07)
  CO   GRAMS/KM (GRAMS/MILE)                       1.31 (  2.11)
  CO2  GRAMS/KM (GRAMS/MILE)                      230.0 ( 370.0)
  NOX  GRAMS/KM (GRAMS/MILE)                        .26 (   .42)
  FUEL CONSUMPTION BY CB L/100KM(MPG)              9.91 ( 23.74)
  CALCULATED DISTANCE KM (MILES)                  21.58 ( 13.41)
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                    TABLE      VEHICLE EMISSION RESULTS
                                        FET                            PROJECT NO. 11-4746-001

VEHICLE NO.  244                            TEST NO.    7  RUN 1              TEST WEIGHT    1591 KG(  3500 LBS)
VEHICLE MODEL    78 VOLVO 244DL             DATE  8/28/79                     ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                   TIME 12:16                        GASOLINE
TRANSMISSION A3                             DYNO NO.  3                       ODOMETER    34995
GVW      0 KG(     -0 LBS)                  CVS NO.   2
                                            BAG CART NO.  1

BAROMETER 739.14 MM HG(29.10 IN HG)         RELATIVE HUMIDITY 58 PCT
DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)       ABSOLUTE HUMIDITY 13.0 GM/KG( 90.7 GRAINS/LB)      NOX HUMIDITY C.F. 1.0799

BAG RESULTS
  BAG NUMBER                                      1
  BLOWER DIF P MM. H2O(IN. H2O)             762.0 (30.0)
  BLOWER INLET P MM. H2O(IN. H2O)           736.6 (29.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)          45.0 (113.0)
  BLOWER REVOLUTIONS                           61579
  CVS FLOW STD. CU. METRES(SCF)             114.3 (4036.3)

  HC   SAMPLE METER/RANGE/PPM               16.5/ 2/   16
  HC   BCKGRD METER/RANGE/PPM                9.8/ 2/   10
  CO   SAMPLE METER/RANGE/PPM               69.6/12/  158
  CO   BCKGRD METER/RANGE/PPM                 .8/12/    1
  CO2  SAMPLE METER/RANGE/PCT               90.3/ 3/ 1.68
  CO2  BCKGRD METER/RANGE/PCT                2.7/ 3/  .04
  NOX  SAMPLE METER/RANGE/PPM               16.9/ 2/   17
  NOX  BCKGRD METER/RANGE/PPM                1.0/ 2/    1

  DILUTION FACTOR                                7.88
  HC   CONCENTRATION PPM                            8
  CO   CONCENTRATION PPM                          149
  CO2  CONCENTRATION PCT                         1.65
  NOX  CONCENTRATION PPM                         16.0

  HC   MASS GRAMS                                 .52
  CO   MASS GRAMS                               19.79
  CO2  MASS GRAMS                              3449.9
  NOX  MASS GRAMS                                3.78

  HC   GRAMS/KM (GRAMS/MILE)                  .03 (   .05)
  CO   GRAMS/KM (GRAMS/MILE)                 1.22 (  1.97)
  CO2  GRAMS/KM (GRAMS/MILE)                213.3 ( 343.2)
  NOX  GRAMS/KM (GRAMS/MILE)                  .23 (   .38)
  FUEL CONSUMPTION BY CB L/100KM(MPG)        9.19 ( 25.60)
  CALCULATED DISTANCE KM (MILES)            16.18 ( 10.05)
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                              TABLE       VEHICLE EMISSION RESULTS
                                                    FTP
                                                                                              PROJECT NO. 11-4746-001
VEHICLE NO.  244
VEHICLE MODEL    78 VOLVO 244DL                       TEST NO.     8  RUN 1                 TEST WEIGHT    1591 KG(  3500 LBS)
ENGINE 2.1 L(130 CID) L-4                             DATE   9/17/79                        ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
TRANSMISSION A3                                       TIME 14:22                            GASOLINE
GVW      0 KG(     -0 LBS)                            DYNO NO.   3                          ODOMETER    39006
                                                      CVS NO.    2
                                                      BAG CART NO.  1

BAROMETER 741.17 MM HG(29.18 IN HG)                   RELATIVE HUMIDITY 33 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)                 ABSOLUTE HUMIDITY  6.6 GM/KG( 46.4 GRAINS/LB)      NOX HUMIDITY C.F.  .8814

BAG RESULTS
  BAG NUMBER                                               1                     2                    3
  DESCRIPTION                                       COLD TRANSIENT          STABILIZED           HOT TRANSIENT
  BLOWER DIF P MM. H2O(IN. H2O)                     800.1 (31.5)          800.1 (31.5)          800.1 (31.5)
  BLOWER INLET P MM. H2O(IN. H2O)                   774.7 (30.5)          774.7 (30.5)          774.7 (30.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)                  43.3 (110.0)          42.8 (109.0)          43.3 (110.0)
  BLOWER REVOLUTIONS                                    40435                 69515                 40479
  CVS FLOW STD. CU. METRES(SCF)                      74.9 (2646.6)        126.9 (4554.3)         75.0 (2649.4)

  HC   SAMPLE METER/RANGE/PPM                        77.2/ 2/    77       12.2/ 2/    12       20.4/ 2/    20
  HC   BCKGRD METER/RANGE/PPM                         7.2/ 2/     7        8.5/ 2/     9       10.8/ 2/    11
  CO   SAMPLE METER/RANGE/PPM                        97.1/11/   507       43.3/13/    40       75.6/13/    75
  CO   BCKGRD METER/RANGE/PPM                          .9/11/     3        1.3/13/     1        2.5/13/     2
  CO2 SAMPLE METER/RANGE/PCT                         66.0/ 3/ 1.18       45.0/ 3/   .77       62.0/ 3/ 1.10
  CO2 BCKGRD METER/RANGE/PCT                          2.6/ 3/   .04        3.6/ 3/   .06        3.4/ 3/   .05
  NOX SAMPLE METER/RANGE/PPM                         30.3/ 2/    30        7.5/ 2/     8       19.7/ 2/    20
  NOX BCKGRD METER/RANGE/PPM                          1.9/ 2/     2        1.6/ 2/     2        1.8/ 2/     2

  DILUTION FACTOR                                        10.81                17.18                12.05
  HC   CONCENTRATION PPM                                 71                    4                   10
  CO   CONCENTRATION PPM                                487                   37                   71
  CO2 CONCENTRATION PCT                                  1.15                  .72                 1.06
  NOX CONCENTRATION PPM                                 28.6                  6.0                 18.0

  HC   MASS GRAMS                                        3.05                  .31                  .45
  CO   MASS GRAMS                                       42.54                 5.59                 6.16
  CO2 MASS GRAMS                                      1574.1               1699.2               1449.3
  NOX MASS GRAMS                                         3.61                 1.30                 2.28

  HC   GRAMS/KM (GRAMS/MILE)                         .53 (   .85)         .05 (   .08)         .08 (   .12)
  CO   GRAMS/KM (GRAMS/MILE)                        7.33 ( 11.80)                              1.05 (  1.70)
  CO2 GRAMS/KM (GRAMS/MILE)                        271.3 ( 436.6)       271.0 ( 436.0)       247.9 ( 398.9)
  NOX GRAMS/KM (GRAMS/MILE)                          .62 (  1.00)         .21 (   .33)         .39 (   .63)
  FUEL CONSUMPTION BY CB L/100KM(MPG)              12.14 ( 19.37)       11.68 ( 20.13)       10.66 ( 22.06)
  CALCULATED DISTANCE KM (MILES)                    5.80 (  3.61)        6.27 (  3.90)        5.85 (  3.63)

COMPOSITE FTP RESULTS
  HC   GRAMS/KM (GRAMS/MILE)                  .16 (   .25)
  CO   GRAMS/KM (GRAMS/MILE)                 2.27 (   3.65 )
  CO2 GRAMS/KM (GRAMS/MILE)                264.69 (425.89)
  NOX GRAMS/KM (GRAMS/MILE)                   .34 (   .55)
  FUEL CONSUMPTION BY CB L/100KM (MPG)      11.50 ( 20.46)
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                                   'TABLE      VEHICLE EMISSION RESULTS
                                                      SET                                  PROJECT NO. 11-4746-001

VEHICLE NO.  244                               TEST NO.    8  RUN 1                 TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                 DATE  9/17/79                        ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                      TIME 15:21                           GASOLINE
TRANSMISSION A3                                DYNO NO.  3                          ODOMETER   39017
GVW     0 KG(    -0 LBS)                       CVS NO.   2
                                               BAG CART NO.  1

BAROMETER 740.16 MM HG(29.14 IN HG)            RELATIVE HUMIDITY 31 PCT
DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)          ABSOLUTE HUMIDITY  6.4 GM/KG( 44.8 GRAINS/LB)      NOX HUMIDITY C.F.  .8757

BAG RESULTS
   BAG NUMBER                                          1
   BLOWER DIF P MM. H2O(IN. H2O)              800.1 (31.5)
   BLOWER INLET P MM. H2O(IN. H2O)            774.7 (30.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)           43.3 (110.0)
   BLOWER REVOLUTIONS                            111936
   CVS FLOW STD. CU. METRES(SCF)              207.1 (7314.9)

   HC  SAMPLE METER/RANGE/PPM                 19.5/ 2/   19
   HC  BCKGRD METER/RANGE/PPM                 10.0/ 2/   10
   CO  SAMPLE METER/RANGE/PPM                 66.5/12/  149
   CO  BCKGRD METER/RANGE/PPM                  1.0/12/    2
   CO2 SAMPLE METER/RANGE/PCT                 72.6/ 3/ 1.32
   CO2 BCKGRD METER/RANGE/PCT                  2.8/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                 19.0/ 2/   19
   NOX BCKGRD METER/RANGE/PPM                  1.3/ 2/    1

   DILUTION FACTOR                                10.05
   HC  CONCENTRATION PPM                            10
   CO  CONCENTRATION PPM                           142
   CO2 CONCENTRATION PCT                           1.28
   NOX CONCENTRATION PPM                          17.8

   HC  MASS GRAMS                                  1.25
   CO  MASS GRAMS                                 34.34
   CO2 MASS GRAMS                               4849.8
   NOX MASS GRAMS                                  6.19

   HC  GRAMS/KM (GRAMS/MILE)                   .06 (   .09)
   CO  GRAMS/KM (GRAMS/MILE)                  1.58 (  2.54)
   CO2 GRAMS/KM (GRAMS/MILE)                 223.1 ( 358.9)
   NOX GRAMS/KM (GRAMS/MILE)                   .28 (   .46)
   FUEL CONSUMPTION BY CB L/100KM(MPG)        9.63 ( 24.42)
   CALCULATED DISTANCE KM (MILES)            21.74 ( 13.51)
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                         TABLE      VEHICLE EMISSION RESULTS
                                              FET                                PROJECT NO. 11-4746-001

VEHICLE NO.  244                              TEST NO.    8  RUN 1               TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                DATE  9/17/79                      ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                     TIME 15:50                         GASOLINE
TRANSMISSION A3                               DYNO NO.  3                        ODOMETER   39030
GVW     0 KG(     -0 LBS)                     CVS NO.   2
                                              BAG CART NO.  1

BAROMETER 740.16 MM HG(29.14 IN HG)           RELATIVE HUMIDITY 28 PCT
DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)         ABSOLUTE HUMIDITY  5.8 GM/KG( 40.5 GRAINS/LB)      NOX HUMIDITY C.F.  .8604

BAG RESULTS
   BAG NUMBER                                         1
   BLOWER DIF P MM. H2O(IN. H2O)              800.1 (31.5)
   BLOWER INLET P MM. H2O(IN. H2O)            774.7 (30.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)           43.3 (110.0)
   BLOWER REVOLUTIONS                            61317
   CVS FLOW STD. CU. METRES(SCF)              113.4 (4006.9)

   HC  SAMPLE METER/RANGE/PPM                 17.8/ 2/   18
   HC  BCKGRD METER/RANGE/PPM                 10.6/ 2/   11
   CO  SAMPLE METER/RANGE/PPM                 88.7/12/  217
   CO  BCKGRD METER/RANGE/PPM                  1.2/12/    2
   CO2 SAMPLE METER/RANGE/PCT                 85.6/ 3/ 1.59
   CO2 BCKGRD METER/RANGE/PCT                  2.7/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                 18.2/ 2/   18
   NOX BCKGRD METER/RANGE/PPM                  1.5/ 2/    2

   DILUTION FACTOR                                 8.33
   HC  CONCENTRATION PPM                            8
   CO  CONCENTRATION PPM                          206
   CO2 CONCENTRATION PCT                          1.55
   NOX CONCENTRATION PPM                          16.9

   HC  MASS GRAMS                                  .55
   CO  MASS GRAMS                                27.27
   CO2 MASS GRAMS                               3220.0
   NOX MASS GRAMS                                 3.15

   HC  GRAMS/KM (GRAMS/MILE)                  .03 (    .06)
   CO  GRAMS/KM (GRAMS/MILE)                 1.68 (   2.71)
   CO2 GRAMS/KM (GRAMS/MILE)                198.9 ( 320.0)
   NOX GRAMS/KM (GRAMS/MILE)                  .19 (    .31)
   FUEL CONSUMPTION BY CB L/100KM(MPG)       8.61 (  27.33)
    ALCULATED DISTANCE KM (MILES)           16.19 (  10.06)
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                                      TABLE      VEHICLE EMISSION RESULTS
                                                          FTP                                           PROJECT NO. 11-4746-001

VEHICLE NO.  244                                 TEST NO.     9  RUN 1                        TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                   DATE  9/24/79                                ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                        TIME 01:55                                   GASOLINE
TRANSMISSION A3                                  DYNO NO.  3                                  ODOMETER   40727
GVW     0 KG(    -0 LBS)                         CVS NO.   2
                                                 BAG CART NO.  1

BAROMETER 742.95 MM HG(29.25 IN HG)              RELATIVE HUMIDITY 52 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)            ABSOLUTE HUMIDITY 10.6 GM/KG( 74.3 GRAINS/LB)      NOX HUMIDITY C.F.  .9967

BAG RESULTS
   BAG NUMBER                                          1                   2                   3
   DESCRIPTION                                  COLD TRANSIENT         STABILIZED         HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                 762.0 (30.0)         762.0 (30.0)        762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)               736.6 (29.0)         736.6 (29.0)        736.6 (29.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)              43.3 (110.0)         42.2 (108.0)        43.3 (110.0)
   BLOWER REVOLUTIONS                                40595                69705               40591
   CVS FLOW STD. CU. METRES(SCF)                  75.9 (2679.1)       130.5 (4609.4)       75.8 (2678.7)

   HC   SAMPLE METER/RANGE/PPM                  86.3/ 2/   86        14.4/ 2/   14       22.6/ 2/   23
   HC   BCKGRD METER/RANGE/PPM                   8.8/ 2/    9        10.5/ 2/   10       11.8/ 2/   12
   CO   SAMPLE METER/RANGE/PPM                  91.5/11/  455         4.9/13/    4       24.5/13/   22
   CO   BCKGRD METER/RANGE/PPM                    .4/11/    1         1.2/13/    1        1.3/13/    1
   CO2  SAMPLE METER/RANGE/PCT                  66.7/ 3/ 1.20        44.4/ 3/  .76       58.5/ 3/ 1.03
   CO2  BCKGRD METER/RANGE/PCT                   3.0/ 3/  .05         3.2/ 3/  .05        2.7/ 3/  .04
   NOX  SAMPLE METER/RANGE/PPM                  28.7/ 2/   29         7.2/ 2/    7       17.8/ 2/   18
   NOX  BCKGRD METER/RANGE/PPM                   2.3/ 2/    2         2.0/ 2/    2        2.0/ 2/    2

   DILUTION FACTOR                                  10.72               17.58               12.91
   HC   CONCENTRATION PPM                              78                   4                  12
   CO   CONCENTRATION PPM                             435                   3                  20
   CO2  CONCENTRATION PCT                            1.16                 .71                1.00
   NOX  CONCENTRATION PPM                            26.6                 5.3                16.0

   HC   MASS GRAMS                                   3.43                 .34                 .51
   CO   MASS GRAMS                                  38.46                 .48                1.78
   CO2  MASS GRAMS                                 1605.3              1706.5              1382.1
   NOX  MASS GRAMS                                   3.85                1.32                2.31

   HC   GRAMS/KM (GRAMS/MILE)                     .59 (   .96)        .06 (   .09)        .09 (   .14)
   CO   GRAMS/KM (GRAMS/MILE)                    6.66 ( 10.72)        .08 (   .13)        .31 (   .50)
   CO2  GRAMS/KM (GRAMS/MILE)                   278.1 ( 447.5)      280.7 ( 451.6)      242.9 ( 390.9)
   NOX  GRAMS/KM (GRAMS/MILE)                     .67 (  1.07)        .22 (   .35)        .41 (   .65)
   FUEL CONSUMPTION BY CB L/100KM(MPG)          12.40 ( 18.98)      11.99 ( 19.61)      10.40 ( 22.61)
   CALCULATED DISTANCE KM (MILES)                5.77 (  3.59)       6.08 (  3.78)       5.69 (  3.54)

COMPOSITE FTP RESULTS
   HC   GRAMS/KM (GRAMS/MILE)               .18 (   .29)
   CO   GRAMS/KM (GRAMS/MILE)              1.52 (  2.45)
   CO2  GRAMS/KM (GRAMS/MILE)            269.75 (434.03)
   NOX  GRAMS/KM (GRAMS/MILE)               .36 (   .58)
   FUEL CONSUMPTION BY CB L/100KM (MPG)   11.64 ( 20.21)
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                                   TABLE      VEHICLE EMISSION RESULTS
                                                       SET                                        PROJECT NO. 11-4746-001

VEHICLE NO.  244                               TEST NO.    9  RUN 1                      TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                 DATE  9/24/79                             ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                      TIME 02:56                                GASOLINE
TRANSMISSION A3                                DYNO NO.  3                               ODOMETER   40739
GVW     0 KG(    -0 LBS)                       CVS NO.   2
                                               BAG CART NO.  1

BAROMETER 742.70 MM HG(29.24 IN HG)            RELATIVE HUMIDITY 47 PCT
DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)          ABSOLUTE HUMIDITY 10.1 GM/KG( 70.9 GRAINS/LB)      NOX HUMIDITY C.F.  .9813

BAG RESULTS
  BAG NUMBER                                        1
  BLOWER DIF P MM. H2O(IN. H2O)               762.0 (30.0)
  BLOWER INLET P MM. H2O(IN. H2O)             736.6 (29.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)            42.8 (109.0)
  BLOWER REVOLUTIONS                             112028
  CVS FLOW STD. CU. METRES(SCF)               209.4 (7397.4)

  HC  SAMPLE METER/RANGE/PPM                  17.4/ 2/   17
  HC  BCKGRD METER/RANGE/PPM                  10.5/ 2/   10
  CO  SAMPLE METER/RANGE/PPM                  18.6/13/   16
  CO  BCKGRD METER/RANGE/PPM                   1.0/13/    1
  CO2 SAMPLE METER/RANGE/PCT                  71.9/ 3/ 1.30
  CO2 BCKGRD METER/RANGE/PCT                   2.7/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                  20.8/ 2/   21
  NOX BCKGRD METER/RANGE/PPM                   2.2/ 2/    2

  DILUTION FACTOR                                 10.26
  HC  CONCENTRATION PPM                               8
  CO  CONCENTRATION PPM                              15
  CO2 CONCENTRATION PCT                            1.27
  NOX CONCENTRATION PPM                            18.8

  HC  MASS GRAMS                                    .96
  CO  MASS GRAMS                                   3.67
  CO2 MASS GRAMS                                 4854.6
  NOX MASS GRAMS                                   7.40

  HC  GRAMS/KM (GRAMS/MILE)                    .04 (   .07)
  CO  GRAMS/KM (GRAMS/MILE)                    .17 (   .28)
  CO2 GRAMS/KM (GRAMS/MILE)                  227.7 ( 366.4)
  NOX GRAMS/KM (GRAMS/MILE)                    .35 (   .56)
  FUEL CONSUMPTION BY CB L/100KM(MPG)         9.74 ( 24.16)
  CALCULATED DISTANCE KM (MILES)             21.32 ( 13.25)
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                                    TABLE     VEHICLE EMISSION RESULTS
                                                        FET                                  PROJECT NO. 11-4746-001

VEHICLE NO.  244                              TEST NO.    9  RUN 1                  TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                DATE  9/24/79                         ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                     TIME                                  GASOLINE
TRANSMISSION A3                               DYNO NO.  3                           ODOMETER    4051
GVW     0 KG(    -0 LBS)                      CVS NO.   2
                                              BAG CART NO.  1

BAROMETER 742.70 MM HG(29.24 IN HG)           RELATIVE HUMIDITY 83 PCT
DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)         ABSOLUTE HUMIDITY 18.9 GM/KG(132.0 GRAINS/LB)      NOX HUMIDITY C.F. 1.3661

BAG RESULTS
   BAG NUMBER                                          1
   BLOWER DIF P MM. H2O(IN. H2O)              762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)            736.6 (29.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)           43.3 (110.0)
   BLOWER REVULUTIONS                             61354
   CVS FLOW STD. CU. METRES(SCF)              114.6 (4047.3)

   HC  SAMPLE METER/RANGE/PPM                 13.3/ 2/   13
   HC  BCKGRD METER/RANGE/PPM                  9.1/ 2/    9
   CO  SAMPLE METER/RANGE/PPM                 10.4/13/    9
   CO  BCKGRD METER/RANGE/PPM                  1.3/13/    1
   CO2 SAMPLE METER/RANGE/PCT                 87.9/ 3/ 1.63
   CO2 BCKGRD METER/RANGE/PCT                  2.5/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                 24.2/ 2/   24
   NOX BCKGRD METER/RANGE/PPM                  2.1/ 2/    2

   DILUTION FACTOR                                 8.19
   HC  CONCENTRATION PPM                            5
   CO  CONCENTRATION PPM                            8
   CO2 CONCENTRATION PCT                         1.60
   NOX CONCENTRATION PPM                         22.4

   HC  MASS GRAMS                                  .35
   CO  MASS GRAMS                                 1.02
   CO2 MASS GRAMS                               3359.1
   NOX MASS GRAMS                                 6.69

   HC  GRAMS/KM (GRAMS/MILE)                    .02 (   .03)
   CO  GRAMS/KM (GRAMS/MILE)                    .06 (   .10)
   CO2 GRAMS/KM (GRAMS/MILE)                  207.9 ( 334.5)
   NOX GRAMS/KM (GRAMS/MILE)                    .41 (   .67)
   FUFL CONSUMPTION BY CB L/100KM(MPG)         8.88 ( 26.49)
   CALCULATED DISTANCE KM (MILES)             16.16 ( 10.04)
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                                     TABLE      VEHICLE EMISSION RESULTS
                                                         FTP
                                                                                           PROJECT NO. 11-4746-001
VEHICLE NO.  244
VEHICLE MODEL    78 VOLVO 244DL                   TEST NO.   10  RUN 1                 TEST WEIGHT   1591 KG(  3500 LBS)
ENGINE 2.1 L(130 CID) L-4                         DATE  9/26/79                        ACTUAL ROAD LOAD    9.2 KW( 12.3 HP)
TRANSMISSION A3                                   TIME 13:05                           GASOLINE EM
GVW      0 KG(     -0 LBS)                        DYNO NO.  3                          ODOMETER   40976
                                                  CVS NO.   2                          40K MILES NATURAL AIR
                                                  BAG CART NO.  1

BAROMETER 743.20 MM HG(29.26 IN HG)               RELATIVE HUMIDITY 39 PCT
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)             ABSOLUTE HUMIDITY  7.9 GM/KG( 55.1 GRAINS/LB)      NOX HUMIDITY C.F.  .9145

BAG RESULTS
   BAG NUMBER                                           1                   2                    3
   DESCRIPTION                                   COLD TRANSIENT        STABILIZED          HOT TRANSIENT
   BLOWER DIF P MM. H2O(IN. H2O)                 762.0 (30.0)         762.0 (30.0)         762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)               736.6 (29.0)         736.6 (29.0)         736.6 (29.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)              43.3 (110.0)         42.2 (108.0)         43.3 (110.0)
   BLOWER REVOLUTIONS                               40539                69651                40524
   CVS FLOW STD. CU. METRES(SCF)                  75.8 (2676.4)       130.4 (4607.2)        75.7 (2675.3)

   HC  SAMPLE METER/RANGE/PPM                    81.3/ 2/   81        12.5/ 2/   13        23.2/ 2/   23
   HC  BCKGRD METER/RANGE/PPM                    10.9/ 2/   11         9.6/ 2/   10         9.9/ 2/   10
   CO  SAMPLE METER/RANGE/PPM                    95.5/11/  491        53.9/13/   51        84.1/13/   84
   CO  BCKGRD METER/RANGE/PPM                      .8/11/    2         1.8/13/    2         1.5/13/    1
   CO2 SAMPLE METER/RANGE/PCT                    67.2/ 3/ 1.21        45.3/ 3/  .78        59.2/ 3/ 1.05
   CO2 BCKGRD METER/RANGE/PCT                     3.0/ 3/  .05         3.1/ 3/  .05         3.2/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                    28.9/ 2/   29         7.3/ 2/    7        18.1/ 2/   18
   NOX BCKGRD METER/RANGE/PPM                     2.2/ 2/    2         2.1/ 2/    2         1.9/ 2/    2

   DILUTION FACTOR                                 10.61                17.10                12.67
   HC  CONCENTRATION PPM                              71                    3                   14
   CO  CONCENTRATION PPM                             472                   48                   80
   CO2 CONCENTRATION PCT                            1.17                  .73                 1.00
   NOX CONCENTRATION PPM                            26.9                  5.3                 16.3

   HC  MASS GRAMS                                   3.12                  .26                  .62
   CO  MASS GRAMS                                  41.62                 7.35                 7.10
   CO2 MASS GRAMS                                 1617.8               1750.0               1389.8
   NOX MASS GRAMS                                   3.57                 1.21                 2.17

   HC  GRAMS/KM (GRAMS/MILE)                     .54 (    .87)        .04 (    .07)        .11 (    .17)
   CO  GRAMS/KM (GRAMS/MILE)                    7.22 (  11.61)       1.18 (   1.91)       1.24 (   1.99)
   CO2 GRAMS/KM (GRAMS/MILE)                   280.6 (  451.4)      282.3 (  454.2)      242.8 (  390.7)
   NOX GRAMS/KM (GRAMS/MILE)                     .62 (   1.00)        .20 (    .32)        .38 (    .61)
   FUEL CONSUMPTION BY CB L/100KM(MPG)         12.53 (  18.77)      12.13 (  19.39)      10.46 (  22.49)
   CALCULATED DISTANCE KM (MILES)               5.77 (   3.58)       6.20 (   3.85)       5.72 (   3.56)

COMPOSITE FTP RESULTS
   HC  GRAMS/KM (GRAMS/MILE)                .16 (    .26)
   CO  GRAMS/KM (GRAMS/MILE)               2.45 (   3.94)
   CO2 GRAMS/KM (GRAMS/MILE)             271.13 (436.25)
   NOX GRAMS/KM (GRAMS/MILE)                .33 (    .54)
   FUEL CONSUMPTION BY CB L/100KM (MPG)   11.76 ( 20.01)
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                              TABLE      VEHICLE EMISSION RESULTS                        PROJECT NO. 11-4746-001
                                                 SET

VEHICLE NO.  244                          TEST NO.   10  RUN 1             TEST WEIGHT   1591 KG(  3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL            DATE  9/26/79                    ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                 TIME 14150                       GASOLINE EM
TRANSMISSION A3                           DYNO NO.  3                      ODOMETER   40987
GVW      0 KG(    -0 LBS)                 CVS NO.   2
                                          BAG CART NO.  1

BAROMETER 742.95 MM HG(29.25 IN HG)       RELATIVE HUMIDITY 33 PCT
DRY BULB TEMP. 27.2 DEG C(81.0 DEG F)     ABSOLUTE HUMIDITY  7.6 GM/KG( 53.1 GRAINS/LB)      NOX HUMIDITY C.F.  .9066

BAG RESULTS
   BAG NUMBER                                      1
   BLOWER DIF P MM. H2O(IN. H2O)            762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)          736.6 (29.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)         43.3 (110.0)
   BLOWER REVOLUTIONS                          111962
   CVS FLOW STD. CU. METRES(SCF)            209.2 (7388.4)

   HC   SAMPLE METER/RANGE/PPM              16.1/ 2/   16
   HC   BCKGRD METER/RANGE/PPM               9.7/ 2/   10
   CO   SAMPLE METER/RANGE/PPM              52.0/12/  111
   CO   BCKGRD METER/RANGE/PPM                .5/12/    1
   CO2  SAMPLE METER/RANGE/PCT              71.4/ 3/ 1.29
   CO2  BCKGRD METER/RANGE/PCT               2.5/ 3/  .04
   NOX  SAMPLE METER/RANGE/PPM              17.5/ 2/   18
   NOX  BCKGRD METER/RANGE/PPM               2.0/ 2/    2

   DILUTION FACTOR                               10.27
   HC   CONCENTRATION PPM                            7
   CO   CONCENTRATION PPM                          106
   CO2  CONCENTRATION PCT                         1.26
   NOX  CONCENTRATION PPM                         15.7

   HC   MASS GRAMS                                 .89
   CO   MASS GRAMS                               25.85
   CO2  MASS GRAMS                              4820.2
   NOX  MASS GRAMS                                5.69

   HC   GRAMS/KM (GRAMS/MILE)                  .04 (   .07)
   CO   GRAMS/KM (GRAMS/MILE)                 1.20 (  1.93)
   CO2  GRAMS/KM (GRAMS/MILE)                223.8 ( 360.0)
   NOX  GRAMS/KM (GRAMS/MILE)                  .26 (   .43)
   FUEL CONSUMPTION BY CB L/100KM(MPG)        9.64 ( 24.41)
   CALCULATED DISTANCE KM (MILES)            21.54 ( 13.39)
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                              TABLE       VEHICLE EMISSION RESULTS
                                                    FET                                      PROJECT NO. 11-4746-001

VEHICLE NO.  244                                   TEST NO.   10  RUN 1                 TEST WEIGHT   1591 KG( 3500 LBS)
VEHICLE MODEL   78 VOLVO 244DL                     DATE  9/26/79                        ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.1 L(130 CID) L-4                          TIME 15:28                           GASOLINE EM
TRANSMISSION A3                                    DYNO NO.  3                          ODOMETER   40999
GVW     0 KG(    -0 LBS)                           CVS NO.   2
                                                   BAG CART NO.  1

BAROMETER 742.95 MM HG(29.25 IN HG)                RELATIVE HUMIDITY 30 PCT
DRY BULB TEMP. 28.9 DEG C(84.0 DEG F)              ABSOLUTE HUMIDITY  7.5 GM/KG( 52.8 GRAINS/LB)      NOX HUMIDITY C.F.  .9054

BAG RESULTS
   BAG NUMBER                                             1
   BLOWER DIF P MM. H2O(IN. H2O)                    762.0 (30.0)
   BLOWER INLET P MM. H2O(IN. H2O)                  736.6 (29.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)                 43.3 (110.0)
   BLOWER REVOLUTIONS                                  61320
   CVS FLOW STD. CU. METRES(SCF)                    114.6 (4046.4)

   HC   SAMPLE METER/RANGE/PPM                      15.7/ 2/   16
   HC   BCKGRD METER/RANGE/PPM                       9.9/ 2/   10
   CO   SAMPLE METER/RANGE/PPM                      60.8/12/  134
   CO   BCKGRD METER/RANGE/PPM                        .7/12/    1
   CO2  SAMPLE METER/RANGE/PCT                      87.7/ 3/ 1.63
   CO2  BCKGRD METER/RANGE/PCT                       3.2/ 3/  .05
   NOX  SAMPLE METER/RANGE/PPM                      22.0/ 2/   22
   NOX  BCKGRD METER/RANGE/PPM                       2.2/ 2/    2

   DILUTION FACTOR                                      8.15
   HC   CONCENTRATION PPM                                  7
   CO   CONCENTRATION PPM                                127
   CO2  CONCENTRATION PCT                               1.59
   NOX  CONCENTRATION PPM                               20.1

   HC   MASS GRAMS                                       .46
   CO   MASS GRAMS                                     16.95
   CO2  MASS GRAMS                                    3329.8
   NOX  MASS GRAMS                                      3.98

   HC   GRAMS/KM (GRAMS/MILE)                       .03 (   .05)
   CO   GRAMS/KM (GRAMS/MILE)                      1.03 (  1.67)
   CO2  GRAMS/KM (GRAMS/MILE)                     203.3 ( 327.1)
   NOX  GRAMS/KM (GRAMS/MILE)                       .24 (   .39)
   FUEL CONSUMPTION BY CB L/100KM(MPG)             8.75 ( 26.89)
   CALCULATED DISTANCE KM (MILES)                 16.38 ( 10.18)
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                          TABLE      VEHICLE EMISSION RESULTS
                                             FTP                                        PROJECT NO. 11-4746-001

VEHICLE NO.0;                              TEST NO.        RUN                    TEST WEIGHT  1364. KG( 3000. LBS)
VEHICLE MODEL   78 VOLVO 244D              DATE  9/28/79                          ACTUAL ROAD LOAD   9.2 KW( 12.3 HP)
ENGINE 2.3 L(*** CID) L-4                  TIME                                   GASOLINE EM274-F
TRANSMISSION A3                            DYNO NO.  3                            ODOMETER  41000.
GVW    0. KG(    0. LBS)                   CVS NO.   2
                                           BAG CART NO.  1

BAROMETER 740.41 MM HG(29.15 IN HG)        RELATIVE HUMIDITY ** PCT
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)      ABSOLUTE HUMIDITY 10.2 GM/KG( 71.3 GRAINS/LB)      NOX HUMIDITY C.F.  .9831

BAG RESULTS
  BAG NUMBER                                    1                     2                    3
  DESCRIPTION                            COLD TRANSIENT          STABILIZED          HOT TRANSIENT
  BLOWER DIF P MM. H2O(IN. H2O)          762.0 (30.0)          762.0 (30.0)         762.0 (30.0)
  BLOWER INLET P MM. H2O(IN. H2O)        736.6 (29.0)          736.6 (29.0)         736.6 (29.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)       43.3 (110.0)          43.3 (110.0)         43.3 (110.0)
  BLOWER REVOLUTIONS                       40625.                69696.               40637.
  CVS FLOW STD. CU. METRES(SCF)           75.6 (2671.2)        129.7 (4582.4)        75.6 (2671.7)

  HC  SAMPLE METER/RANGE/PPM             76.2/ 2/  76.         11.7/ 2/  12.        20.9/ 2/  21.
  HC  BCKGRD METER/RANGE/PPM              8.1/ 2/   8.          7.5/ 2/   8.         6.9/ 2/   7.
  CO  SAMPLE METER/RANGE/PPM             22.6/ 3/ 522.         61.8/13/  60.        75.7/13/  75.
  CO  BCKGRD METER/RANGE/PPM               .1/ 3/   2.          4.9/13/   4.         2.3/13/   2.
  CO2 SAMPLE METER/RANGE/PCT             66.3/ 3/ 1.19         44.0/ 3/  .75        59.2/ 3/ 1.05
  CO2 BCKGRD METER/RANGE/PCT              2.9/ 3/  .04          3.4/ 3/  .05         3.7/ 3/  .06
  NOX SAMPLE METER/RANGE/PPM             31.5/ 2/  32.          5.1/ 2/   5.        18.3/ 2/  18.
  NOX BCKGRD METER/RANGE/PPM              1.2/ 2/   1.          1.1/ 2/   1.         1.2/ 2/   1.

  DILUTION FACTOR                            10.75                 17.64                12.68
  HC  CONCENTRATION PPM                      69.                   5.                   15.
  CO  CONCENTRATION PPM                     499.                  54.                   70.
  CO2 CONCENTRATION PCT                      1.15                  .70                  .99
  NOX CONCENTRATION PPM                     30.4                   4.1                  17.2

  HC  MASS GRAMS                              3.00                  .35                  .63
  CO  MASS GRAMS                             43.94                 8.14                 6.21
  CO2 MASS GRAMS                           1591.3                1671.5               1378.1
  NOX MASS GRAMS                              4.33                  .99                 2.45

  HC  GRAMS/KM (GRAMS/MILE)                .52 (   .84)        .06 (   .09)         .11 (   .18)
  CO  GRAMS/KM (GRAMS/MILE)               7.65 ( 12.31)       1.34 (  2.15)        1.09 (  1.75)
  CO2 GRAMS/KM (GRAMS/MILE)              277.0 ( 445.7)      274.8 ( 442.1)       241.1 ( 388.0)
  NOX GRAMS/KM (GRAMS/MILE)                .75 (  1.21)        .16 (   .26)         .43 (   .69)
  FUEL CONSUMPTION BY CB L/100KM(MPG)    12.41 ( 18.96)      11.83 ( 19.89)       10.38 ( 22.66)
  CALCULATED DISTANCE KM (MILES)          5.74 (  3.57)       6.08 (  3.78)        5.72 (  3.55)

COMPOSITE FTP RESULTS
  HC  GRAMS/KM (GRAMS/MILE)          .17 (   .27)
  CO  GRAMS/KM (GRAMS/MILE)         2.59 (  4.16)
  CO2 GRAMS/KM (GRAMS/MILE)       265.94 (427.90)
  NOX GRAMS/KM (GRAMS/MILE)          .36 (   .58)
  FUEL CONSUMPTION BY CB L/100KM (MPG)   11.55 ( 20.37)
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